PROJECT MANUAL

FOR

UA Alpha Phi House

Alpha Phi Intentional Fraternity, Inc.

12.18.2025
Construction Documents

Architect
WER Northwest Arkansas
545 West Center St
Fayetteville, AR 72701
479.966.4477

Associate Architect
HBRA
372 West Ontario Street, Suite 501
Chicago, Illinois 60654
312.-527-3200

Construction Manager
CR Crawford
1102 South Happy Hollow Road
Fayetteville, Arkansas 72701

MEP, & Fire Protection Engineers
PRIGM ENGINEERING, PLLC
310 W. Dickson Street, Ste. 210
Fayetteville, AR 72701
479-877-3188

Civil Engineers
Development Consultants
1 E Center Street, Ste 290
Fayetteville, AR 72701
479-444-7880

Structural Engineers
Tatum Smith Welcher Engineers
3100 S. Market St., Ste 202
Rogers, AR 72758
479.621.6128

Landscape Architects
Duke Design Group
33 Music Square West 106A
Nashville, TN 37203
615-270-5020

ARCHITECT'S PROJECT NUMBER
UAFAPH24.01

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ARCHITECT

I HEREBY CERTIFY THAT THIS PROJECT MANUAL WAS PREPARED BY ME, OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY LICENSED ARCHITECT UNDER THE LAWS OF THE STATE OF ARKANSAS.

NAME: JOHN LANGHAM, AIA DATE: 12/18/2025 REG. NO LL-200

END OF SECTION



SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL V.22

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Geotechnical Report: Entitled Geotechnical Report Proposed Alpha Phi Sorority House, University of Arkansas at Fayetteville, Arkansas, dated March 20, 2025.
   1. Original copy is bound into Project Manual following this section.
   2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
   3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
   4. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

1580 E. Stearns Street
Fayetteville, Arkansas 72703
(479) 443.2377
mce.us.com

March 20, 2025

Alpha Phi International Fraternity
1985 S. Josephine Street
Denver, Colorado 80210

ATTN: Ms. Kimberly Roberson
Project Manager

RE: Geotechnical Report for
University of Arkansas
Alpha Phi Sorority House
Fayetteville, Arkansas
MCE Project Number: 25-3804

CERTIFICATE OF AUTHORIZATION
McCLELLAND CONSULTING ENGINEERS, INC.
No. 24
ARKANSAS-ENGINEER

Dear Ms. Roberson:

We are submitting herewith the report for the Geotechnical Report on the above-referenced project. We appreciate the opportunity to provide this service to you. If there are any questions regarding the Geotechnical Investigation, please contact us.

Sincerely yours,

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

Steven J. Head, PE
Principal | Geotechnical Department Head

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 16434
STEVEN J. HEAD
03/20/2025

William M. Hopkins, EI
Geotechnical Specialist

Cody L. Traywick, PG
Associate | Geotechnical Supervisor | Project Manager

Enclosure: Geotechnical Report

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

1580 East Stearns Street
Fayetteville, Arkansas 72703
mce.us.com



GEOTECHNICAL REPORT

Alpha Phi Sorority House
University of Arkansas

Project No. 25-3804
March, 2025

Prepared For:
Alpha Phi International Fraternity
Ms. Kimberly Roberson
1985 S. Josephine Street
Denver, CO 80210
kroberson@alphaphi.org

GEOTECHNICAL REPORT

Alpha Phi Sorority House
University of Arkansas
MCE Project Number: 25-3804
Fayetteville, Arkansas

FOR

Alpha Phi International Fraternity
1985 S. Josephine Street
Denver, Colorado 80210

Executive Summary

This is a report of the findings of the Geotechnical Investigation for the Alpha Phi Sorority House development to be located on the University of Arkansas campus in Fayetteville, Arkansas. This report includes information on surface materials and subsurface conditions in addition to providing recommendations for site preparation, grading, structure foundations, and recommended minimum pavement sections. The significant findings listed below should not be used separately from the further discussion provided in the body of this report.

- This Geotechnical Investigation consisted of a total of seven (7) project borings.
    - Groundwater, true and/or perched, was not encountered during this investigation.
    - Auger refusal materials in the form of limestone and shale were encountered by project borings B-02 through B-07 at depths ranging from approximately 10.0 to 15.0 feet below the existing surface elevations (elevations ranging from approximately 1,367.1 feet to 1,378.8 feet).
- Surface materials encountered during this investigation consisted of topsoil, gravel, and asphalt pavement materials.
    - The topsoil was encountered within project borings B-01, B-04, and B-05, with thicknesses ranging from approximately eight (8) to 10 inches.
    - The gravel surface materials were encountered within project borings B-02 and B-06, with thicknesses of approximately four (4) and six (6) inches, respectively.
    - Asphalt pavement with an underlying base course was observed to be present within project borings B-03 and B-07. The asphalt materials were observed to have thicknesses ranging from one (1) to three (3) inches, while the underlying base was observed to have a thickness of approximately one (1) inch in each occurrence.
- The materials that make up Stratum II consist of Lean Clay (CL), Lean Clay with Gravel (CL), and Sandy Lean Clay (CL).
- The materials that make up Stratum III consist of Silty Sand (SM), Silty Sand with Gravel (SM), and Clayey Sand with Gravel (SC).
- The materials that make up Stratum IV consist of highly weathered shale materials.
- The materials that make up Stratum V consist of limestone materials.
- The materials that make up Stratum VI consist of competent shale materials.
- It is likely that materials requiring the use of rock-removal techniques, such as hammer-hoe attachments, may be encountered within footing and utility excavations relevant to the western portion of the structure, but it is not likely that these materials will be encountered in excavations within the central and eastern portion of the structure.

- It is anticipated that the subsurface materials within the west wing of the building footprint will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 0.2 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from 1,376.4 to 1,387.6 feet).
- It is anticipated that the subsurface materials within the central and eastern wing of the building footprint will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 0.5 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from approximately 1,384.8 to 1,390.7).
- It is anticipated that subsurface materials within the project pavement dimensions will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 2.3 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from approximately 1,378.5 to 1,387.5 feet).
- A shallow foundation system consisting of a combination of spread and continuous footings is recommended to be adequate for the support of the planned chapter sorority house.
    - Footings bearing on a minimum of one (1) foot of properly compacted and moisture-conditioned select fill materials placed on suitable in-situ materials may utilize safe allowable bearing capacities of 2,300 pounds per square foot (psf) for continuous footings and 2,500 psf for spread footings.
- It is recommended that project pavements bear on a minimum of one (1) foot of properly compacted and moisture-conditioned select fill materials.
    - However, based on the subsurface conditions encountered during this investigation, it is recommended that the Contractor budget for an average of three (3) feet of undercut within the pavement dimensions to expose suitable in-situ materials, prior to the placement of imported select fill.
    - Final recommendations regarding undercut should be made by the Geotechnical Engineer or his/her representative at the time of construction.

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1.0 Introduction

McClelland Consulting Engineers, Inc. (MCE) conducted a subsurface investigation for the planned Alpha Phi Sorority House development to be located on the campus of the University of Arkansas in Fayetteville, Arkansas. The investigation was requested by Ms. Kimberly Roberson and authorized by Ms. Amber Harris, both with the Alpha Phi International Fraternity. This investigation was intended to explore the subsurface soil conditions within the planned development area to provide recommendations for site preparation, grading, structure foundations, and recommended minimum pavement sections.

2.0 Existing Site Description

The project site is located on the University of Arkansas campus in Fayetteville, Arkansas. At the time of preparing this report, the site is comprised of five (5) parcels, with six (6) physical addresses of 540 N. Frisco Avenue, 542 N. Frisco Avenue, 512 N. Frisco Avenue, 522 W. Maple Street, 501 N. Wilson Avenue, and 535 N. Wilson Avenue. These parcels may be described by Washington County Parcel numbers 765-12656-000, 765-12657-000, 765-12277-000, 765-12279-000, and 765-12278-000, for a total size of approximately 1.7 acres.

At the time of preparing this report, the existing site developments consist of two (2) single family residences, two (2) multi-family residences, and their associated pavement and utility improvements. Additionally, site vegetation consists of low to medium-cut grass and trees of varying size.

Topographically, the project site exhibits a downward slope from the east to the west, with maximum grade differentials estimated to be on the order of 18 feet.

Figure 1 below provides a visualization of the site conditions at the time of this investigation.



Figure 1: Existing Site Conditions
Left: Towards 501 N. Wilson Ave.; Oriented Southwest
Left Center: Towards 535 N. Wilson Ave.; Oriented West
Right Center: Towards 543 N. Frisco Ave.; Oriented North
Right: Towards 522 W. Maple Street; Oriented Southeast

3.0 Project Scope

It is understood that the project scope includes the new construction of a sorority chapter house on the campus of the University of Arkansas with a structural footprint of 14,000 square-feet (SF). The house is planned to be a three (3) – story structure with a partial basement, fronting W. Maple Street. The partial basement is planned to be located within the western “wing” of the structure and is understood to have a finished-floor elevation (FFE) of 1,380.5 feet. The main level (ground floor throughout the remainder of the structure) is planned to have an FFE of 1,394.5 feet. Through discussions with the Design Team, it is anticipated that the basement of the structure will feature a slab-on-grade, with concrete and steel construction, and the first floor will receive a concrete slab-on-deck above the basement and a slab-on-grade where the basement is not present. The remainder of the structure framing is anticipated to be made up of conventional timber construction.

Structural loading conditions were not available at the time of preparing this report; however, it is anticipated that maximum column and wall loads will not exceed 100 kips and three (3) kips per linear foot (klf).

In addition to the chapter house, it is understood that a parking area will be constructed in the northern portion of the lot. As the final pavement types are unknown at the time of preparing this report, recommendations for the use of both flexible asphalt and rigid concrete pavement have been provided for the consideration of the Design Team.

Figure 2 below was snipped from the provided Parking Study design sketch.

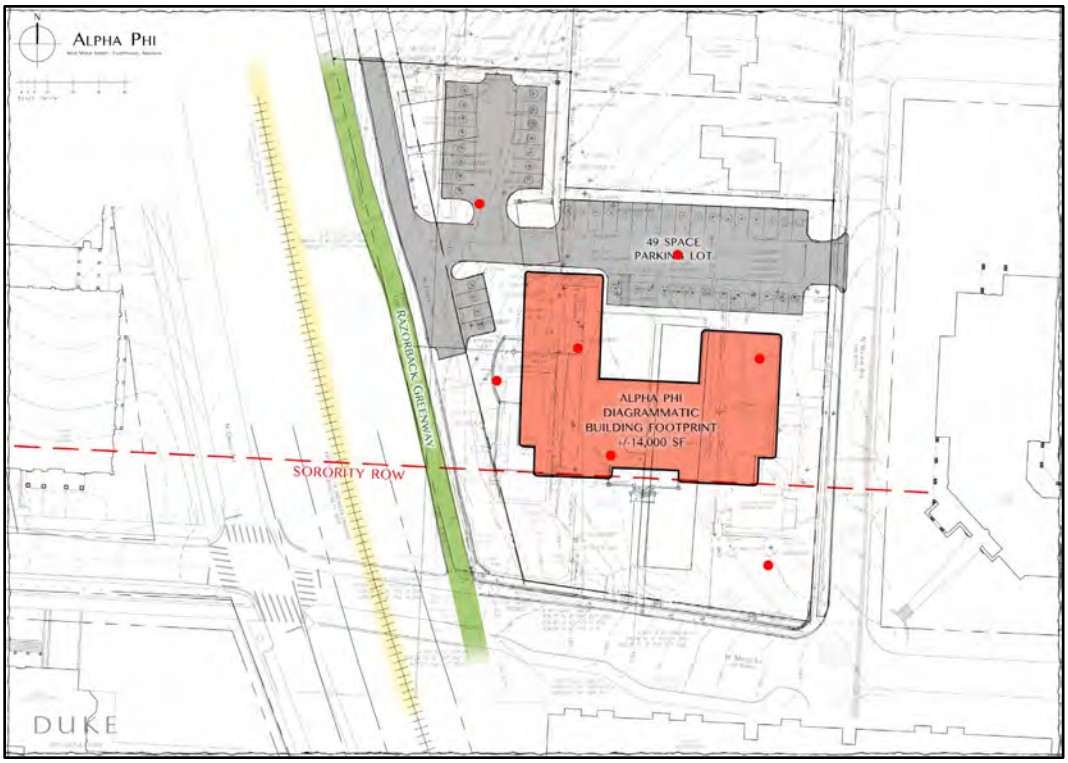


Figure 2: Overall Site Plan Snip
This site plan was snipped from the provided Parking Study design sketch, dated January 30, 2025

4.0 Field Investigation

Based on the provided information, MCE conducted a Geotechnical Investigation consisting of seven (7) total project borings. These borings were laid out across the planned project site to obtain the appropriate subsurface data for the project scope. Table 1 below provides details on the project borings, their relevant improvement features, and their planned target depths.

Table 1: Project Boring Locations and Target Depths

Boring ID	Target Depth (ft)	Location in the Development Area
B-01	6.5	Parking Improvements
B-02	30.0	Chapter House
B-03	20.0	Chapter House
B-04	20.0	Parking Improvements
B-05	30.0	Chapter House
B-06	30.0	Chapter House
B-07	30.0	Chapter House

Boring layouts are provided on Plates 1 and 2 in Appendix A, and the boring logs can be referenced in Appendix B on Plates 3 through 14. A key to the terms and symbols utilized on the boring logs is presented in Appendix B on Plate 15.

All project borings were conducted using a CME-45B truck-mounted drill rig, utilizing 4.5-inch diameter solid stem augers. Soil samples were obtained at the depths indicated on the boring logs with the use of a two (2) inch diameter split-spoon sampler.

The split-spoon sampler was driven by blows from a 140-pound automatic hammer dropped from a fixed height of 30 inches. The number of blows required to drive the split-spoon sampler the final 12 inches of an 18-inch drive, or portion thereof, is referred to as the Standard Penetration value, N, and is recorded on the boring logs in units of blows-per-foot. Final drilled depths are shown as the depths achieved by the split-spoon sampler.

In addition to Standard Penetration Testing (SPT), the field tests performed included visual soil and rock classifications and groundwater observations. Table 2 below details for each project boring.

Table 2: Project Boring Details

Boring ID	Existing Surface Elevations (ft)	Surface Material	Surface Material Thickness (in)	Planned Target Depth (ft)	Auger Refusal Depth (ft)	End of Boring Depth (ft)	End of Boring Elevation (ft)
B-01	1,382.2	Topsoil	8	6.5	-	6.3	1,375.9
B-02	1,380.1	Gravel	4	30.0	13.0	30.0	1,350.1
B-03	1,386.3	Asphalt / Gravel	3 / 1	20.0	10.0	23.0	1,363.3
B-04	1,389.8	Topsoil	10	20.0	11.0	11.0	1,378.8
B-05	1,388.5	Topsoil	10	30.0	12.5	28.0	1,360.5
B-06	1,391.2	Gravel	6	30.0	15.0	20.0	1,371.2
B-07	1,387.8	Asphalt / Gravel	1 / 1	30.0	10.0	30.0	1,357.8

NOTES: Elevations shown in Table 2 are rounded to the nearest one (1) foot, and based on topographic information provided by Development Consultants Incorporated in February 2025.
Reported thicknesses of the surface materials are rounded to the nearest one (1) inch.

4.1 Encountered Groundwater Conditions

At the time of the investigation, groundwater was not encountered within any of the project borings. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below the project site. Project grading should be properly designed to discharge any surface water that may develop following precipitation events.

Although groundwater was not encountered during this investigation, stiff clays and rock materials were observed throughout the project borings. As a result of the low permeability of these materials, water has the potential to collect in a “perched” condition during and after precipitation events.

This could cause significant issues during undercutting and utility installation operations if not properly mitigated. Any groundwater or perched water must be removed, if encountered during construction, prior to the placement of fill or paving elements. To help reduce the potential for issues related to perched groundwater, it is recommended that earthwork operations take place during historically dry portions of the calendar year (June through September). Earthwork operations conducted outside of this recommended timeframe should expect general dewatering measures to be required to maintain a desirable construction schedule.

4.2 Encountered Auger Refusal Materials

Auger refusal materials are generally defined as materials that prevent the advancement of the boring depth through traditional auger drilling techniques. Refusal is somewhat subjective and is dependent on the type of drilling equipment used and the down pressures exerted by the drill rig.

At the time of this investigation, refusal materials in the form of limestone and shale were encountered by project borings B-02 through B-07 at depths ranging from approximately 10.0 to 15.0 feet below the existing surface elevations (elevations ranging from approximately 1,367.1 feet to 1,378.8 feet). These materials are indicative of the underlying Bloyd Shale Formation.

More information on the local geology and how it may affect the project site can be found in the *Local Geology of the Project Site* section of this report (*Section 7.0*). Additional guidance regarding these materials and the potential for difficult excavation conditions are provided in the *Rock Excavation Considerations* section of this report (*Section 10.4*).

5.0 Laboratory Analysis

Laboratory tests were performed on soil and rock samples recovered from the borings. The laboratory tests were conducted to determine the engineering properties of the project strata. The tests performed on samples from the borings included moisture content, Atterberg Limits, and sieve analyses of the soil samples, and unconfined compressive strength of the rock samples.

The results of the laboratory testing for the project borings are provided on the boring logs and in the Laboratory Testing Results, found in Appendix C on Plates 16 and 17. Table 3 below shows the relevant test method specifications utilized on the project.

Table 3: Laboratory Test Method Specifications

Test Designation	Test Method
ASTM D2488	Standard Practice for Description and Identification of Soils (Visual)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purpose (USCS)
ASTM D2216	Standard Test Method for Lab Determination of Water Content of Soil
ASTM D6913	Standard Test Method for Particle-Size Distribution of Soils Using Sieve Analysis
ASTM D4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D7012	Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens Under Varying States of Stress and Temperatures

6.0 On-Site Soil Conditions

The following project sections provide information regarding on-site conditions at the project location. This information includes descriptions of the existing soil types, imagery showing the approximate location of the existing soil types, and details about the local geology.

6.1 United States Department of Agriculture (USDA) Soil Types and Map

The following soil types exist in the project area according to current USDA soil maps, with descriptions from the Natural Resources Conservation Service (NRCS). The project site is located in Washington County in Northwest Arkansas. The existing soil types are briefly detailed in Table 4 below. Figure 3 on the following page provides imagery of the approximate site location and how it relates to the existing soil types.

Table 4: USDA Local Soil Types

USDA Soil Type	USDA Symbol	USDA Descriptions
Enders Gravelly Loam	EnD	The Enders series consists of deep, well-drained, very slowly permeable soils that formed in loamy and clayey residuum from shale or interbedded shale and sandstone. These soils are on nearly level to moderately steep upland mountaintops and ridges and gently sloping to very steep mountain sideslopes and footslopes. Slopes range from one (1) to 65 percent.
Fayetteville Fine Sandy Loam	FaC2	The Fayetteville series consists of deep, well-drained, moderately permeable soils that formed in residuum or colluvium from slightly calcareous sandstone. These nearly level to steep soils are on uplands of the Boston Mountains. Slopes range from three (3) to 40 percent.



Figure 3: USDA Soil Survey Report Image
The image was produced by the United States Department of Agriculture.
The red outline represents the approximate extent of the project site.

7.0 Local Geology of the Project Site

According to maps and literature published by the United States Geological Survey (USGS) and the Arkansas Geological Survey (AGS), the project site is underlain by the Middle Pennsylvanian-Morrowan Age (299 to 323 million years old) Bloyd Shale and the Prairie Grove Member of the Hale Formation. It should be noted that a fault line is currently mapped as trending from the southwest to the northeast, approximately 500 feet southeast of the project site.

Brief descriptions from the Stratigraphic Summary of Arkansas – Information Circular 36 (IC36) of the local geologic formations are provided below and on the following page.

7.1 Bloyd Formation / Bloyd Shale Formation

The Bloyd Formation consists of (in ascending order): the Brentwood Limestone Member, the Woolsey Member, Dye Shale Member, Kessler Limestone Member, and the Trace Creek Shale Member (Considered a part of the Atoka Formation by many modern workers).

The Brentwood is a sequence of limestones separated by thick intervals of dark shale. The normal sequence usually has two (2) to four (4) limestones intervals; however, east of the type region, the unit becomes sandier. The Woolsey is composed of terrestrial sediments comprised of dark-gray, fissile shale often interbedded with thin siltstones. A thin coal bed, called the Baldwin Coal, occurs at or near the top of the Woolsey. To the east of Washington County, the Woolsey is replaced by a thick, fine- to medium-grained, cross bedded sandstone facies commonly referred to as the Middle Bloyd Sandstone. This unit frequently contains quartz granules and is a common bluff-former. The Middle Bloyd Sandstone is normally mapped as part of the Dye Shale. The marine-deposited Dye Shale Member is predominantly a dark-gray shale with scattered calcareous concretions. Where underlain by the Woolsey, the Dye frequently has a bed of calcareous sandstone with scattered clay pebbles and quartz granules, called caprock, at its base.

The Kessler Limestone Member is either a single unit of limestone or a sequence of limestone and shale interbedded. The limestones are bioclastic and oolitic and contain abundant oncoliths, traces of clay-pebble conglomerate, and minor amounts of calcareous sandstone.

The Kessler seems to be absent east of central Madison County. The Trace Creek Shale Member is composed of dark-gray shales with some thin beds of sandstone. The sandstone beds become thicker and more common towards the top of the unit.

The base of the Bloyd is considered conformable, but unconformities are recognized at the base of the Dye and at the base of the Trace Creek. Typical thicknesses reported for the Bloyd range between 175 and 200 feet.

7.2 Hale Formation

The Hale Formation is made up of two (2) members: a lower Cane Hill Member and an upper Prairie Grove Member. The Cane Hill Member is typically composed of dark gray silty shale interbedded with siltstone and thin bedded fine-grained sandstone. Some lithologies are locally calcareous. Isolated thick to massively bedded sandstones sometimes occur in this section. The lower contact of the Cane Hill marks the Mississippian-Pennsylvanian boundary in north Arkansas.

The Prairie Grove Member is composed of thin to massive, often cross bedded, frequently pitted (“honeycomb weathering”), light gray to dark brown, limy sandstone or variously sandy limestone with lenses of relatively pure, crinoidal, highly fossiliferous limestone, and oolitic limestone. Prairie Grove outcrops frequently have a mottled appearance when fresh. The lower contact of the Prairie Grove is considerably unconformable.

The Hale (Cane Hill) rests with pronounced unconformity upon older strata. The reported thickness of the Hale ranges from a few feet to more than 300 feet.

7.3 Structural Geology of the Project Site

It is prudent to mention that the project site is in close proximity to a known fault or fault zone; the Fayetteville Fault. The Fayetteville Fault is a known “normal fault” with its downthrown side on the southeast. This fault or fault system trends from the southwest to the northeast. Modern literature indicates that the Fayetteville Fault is not currently active.

Figure 4 on the following page provides a visual of the local geologic formations in relation to the project site. The heavier black lines trending southwest to northeast represent the Fayetteville Fault.

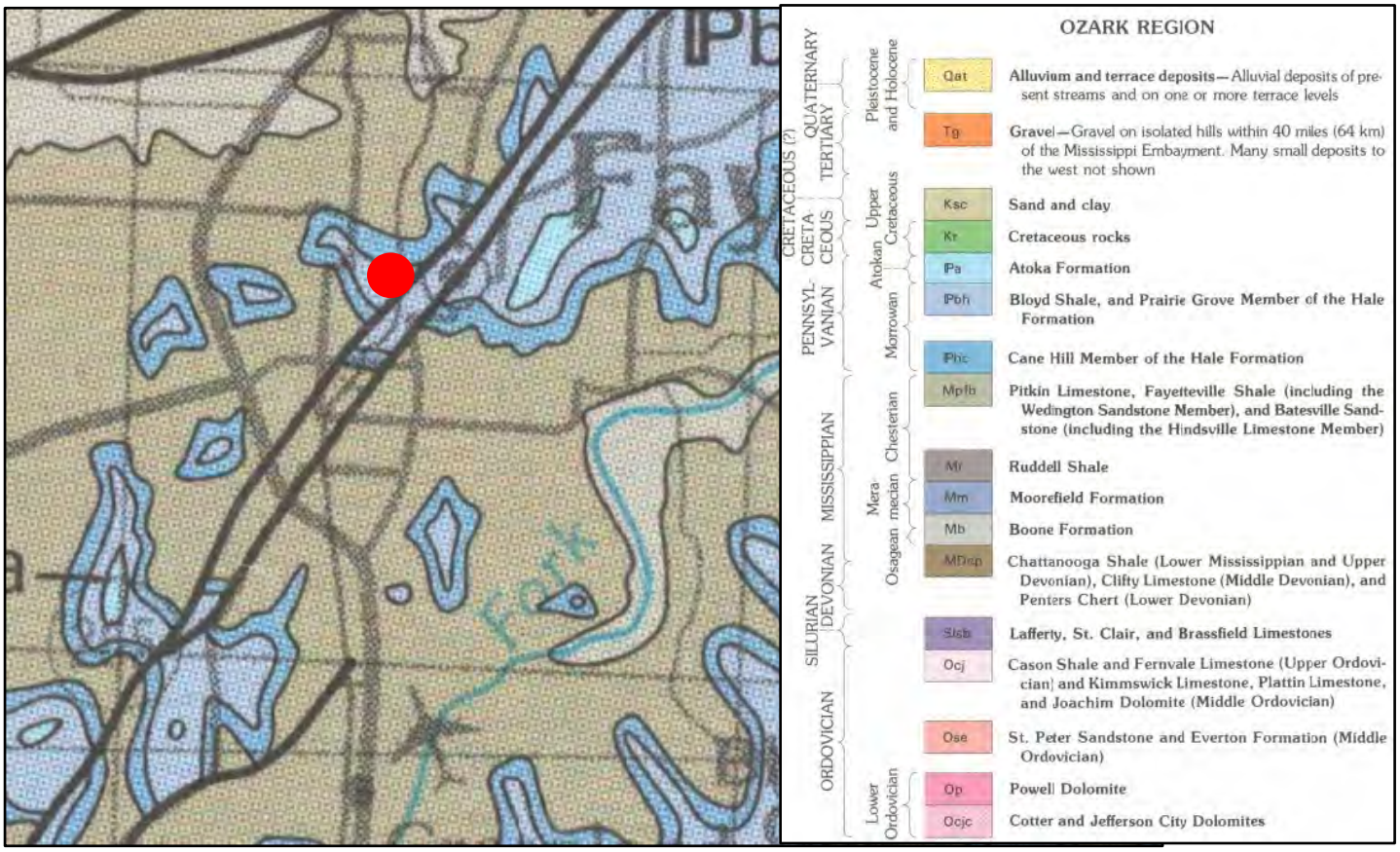


Figure 4: Image from the Geologic Map of Arkansas (1993)
The red dot represents the approximate location of the project site.

8.0 IBC Site Classification

The proposed development area is recommended to be assigned as a Risk Category II according to Table 1604.5 of the 2021 International Building Code (IBC). The site seismic classification determination may utilize spectral response accelerations S_{DS} and S_{D1} of 0.139 and 0.091 respectively, with reference to Section 1613 of the 2021 IBC and the American Society of Civil Engineers (ASCE) Standard 7-16, based on a Site Class C for the soil profile within the project area.

9.0 On-Site Soil Stratum Summary

This summary is based on a collection of field notes and field-testing values recorded during the investigation, notes recorded during the laboratory analysis, and results from the laboratory testing. The encountered subsurface soil and rock conditions are summarized below.

9.1 Stratum I – Surface Materials

The surface materials encountered during this investigation consisted of topsoil, gravel, and asphalt pavement materials. The topsoil was encountered within project borings B-01, B-04, and B-05, with thicknesses ranging from approximately eight (8) to 10 inches. The gravel surface materials were encountered within project borings B-02 and B-06, with thicknesses of approximately four (4) and six (6) inches, respectively. Asphalt pavement with an underlying base course was observed to be present within project borings B-03 and B-07. The asphalt materials were observed to have thicknesses ranging from one (1) to three (3) inches, while the underlying base was observed to have a thickness of approximately one (1) inch in each occurrence.

These thicknesses are only valid for the project boring locations and may vary in unexplored portions of the project site.

9.2 Stratum II – Fine-Grained Subgrade Materials

The materials that make up Stratum II consist of Lean Clay (CL), Lean Clay with Gravel (CL), and Sandy Lean Clay (CL). These materials were generally encountered in varying shades of brown and contained varying gradations of fines, sand, and gravel.

Consistency values for the Stratum II CL materials ranged from medium stiff to hard, with corresponding N-values ranging from five (5) to greater than 50. The natural soil moisture content for these materials ranged from 12.3 to 36.3 percent, in accordance with ASTM D2216. The Liquid Limit (LL) of these materials ranged from 25 to 48, with Plasticity Index (PI) values ranging from 11 to 23. The fine fraction of these materials exhibited low to moderate plasticity characteristics and a low to moderate potential for volumetric change due to alterations in the soil's moisture content. The fine fraction of these soils makes up between 50 and 79 percent of the overall soil mass, as indicated by the results of gradation analysis from the borings.

9.3 Stratum III – Coarse-Grained Subgrade Materials

The materials that make up Stratum III consist of Silty Sand (SM), Silty Sand with Gravel (SM), and Clayey Sand with Gravel (SC). These materials were generally encountered in various shades of brown, with the occasional occurrence of gray, and contained varying gradations of fines, sand, and gravel.

Consistency values for the Stratum III SM materials ranged from loose to very dense, with corresponding N-values ranging from four (4) to greater than 50. The natural soil moisture content for these materials ranged from 9.1 to 34.2 percent. These materials were found to be non-plastic (NP), exhibiting negligible plasticity characteristics and a negligible potential for volumetric change due to alterations in the soil's moisture content. The fine fraction of these soils makes up between 24 and 32 percent of the overall soil mass, as indicated by the results of gradation analysis from the borings.

Consistency values for the Stratum III SC materials ranged from medium dense to very dense, with corresponding N-values ranging from 11 to greater than 50. The natural soil moisture content for these materials ranged from 12.0 to 27.6 percent. The LL of these materials was found to be 34, with a PI value of 15. The fine fraction of these materials exhibited low to moderate plasticity characteristics and a low potential for volumetric change due to alterations in the soil's moisture content. The fine fraction of these soils makes up approximately 48 percent of the overall soil mass, as indicated by the results of gradation analysis from the borings.

9.4 Stratum IV – Highly Weathered Shale Materials

The Stratum IV highly weathered shale materials were encountered in project borings B-03, B-05, and B-06, beginning at depths ranging from approximately 5.9 to 8.5 feet below the existing surface elevations. These materials were generally observed in various shades of brown and grayish-brown.

Consistency values for the Stratum IV materials ranged from soft to hard, with corresponding N-values ranging from 23 to greater than 50. The natural soil moisture content for these materials ranged from 9.5 to 16.1 percent. The LL of these materials was found to be 52, with a PI value of 28. The fine fraction of these materials exhibited moderate to high plasticity characteristics and a moderate potential for volumetric change due to alterations in the soil's moisture content. The fine fraction of these materials makes up approximately 82 percent of the overall material mass, as indicated by the results of gradation analysis from the borings.

9.5 Stratum V – Limestone Materials

The Stratum V limestone materials were generally observed to be present between the overburden (Stratum I, II, III, and IV) and the competent shale materials within project borings B-02, B-03, B-05, and B-06. It should be noted that a thin lens of "competent" (non-weathered shale) was observed above the encountered limestone within project boring B-05. The limestone was first encountered at depths ranging from approximately 10.0 to 15.0 feet below the existing surface elevations (elevations ranging from approximately 1,367.1 feet to 1,376.3 feet).

The limestone materials were generally observed to be light gray to gray in color and exhibited unconfined compressive strengths ranging from approximately 390 to 700 tons per square foot (tsf). The unit weight of the limestone was measured as ranging from approximately 162 to 175 pounds per cubic foot (pcf)

A breakdown of all of the rock cores tested as part of the project scope are provided in *Section 9.6.*

9.6 Stratum VI – Competent Shale Materials

The Stratum VI shale materials were observed to be present within project borings B-02, B-03, and B-05 through B-07, beginning at depths ranging from approximately 12.5 to 17.5 feet below the existing surface elevations (elevations ranging from approximately 1,362.6 to 1,377.8 feet). The shale materials were generally observed in various shades of gray and exhibited relative consistency values ranging from soft to hard. The unconfined compressive strengths of these materials were observed to range from approximately 35 to 435 tsf, with unit weights ranging from approximately 145 to 165 pcf.

The results of the rock core analyses, as well as the percentage of recovery (REC) and rock-quality designation (RQD) of the tested core runs, are provided in Table 5 below. It should be noted that the materials described in this table represent the core sample collected for the unit weight and ultimate compressive strength measurement from each run and may not be indicative of the entire core run. Transitions between the observed limestone and shale occurred during several core runs (indicative of the Bloyd Formation / Bloyd Shale Formation).

Table 5: Rock Core Data

Boring ID	Core Run	Depth (feet)	Description of Material	Recovery (%)	RQD (%)	Unit Weight (pcf)	Ultimate Compressive Strength (tsf)
B-02	1	15.5	Limestone	98%	44%	162	590
B-02	2	20.0	Shale	100%	30%	157	75
B-02	3	24.5	Shale	100%	87%	161	130
B-02	4	29.0	Shale	87%	80%	161	145
B-03	1	11.0	Limestone	98%	48%	166	390
B-03	2	17.0	Shale	58%	6%	145	35
B-03	3	22.0	Shale	100%	70%	160	400
B-05	2	14.0	Limestone	51%	40%	175	700
B-05	4	26.0	Shale	98%	45%	165	360
B-06	1	19.0	Limestone	100%	59%	163	510
B-07	2	17.0	Shale	96%	85%	162	435
B-07	3	22.0	Shale	100%	90%	160	100
B-07	4	27.0	Shale	100%	84%	160	90

10.0 Engineer's Analysis and Recommendations

At the time of preparing this report, it is understood that the project scope includes the new construction of a 14,000 SF footprint sorority chapter house on the campus of the University of Arkansas, located in Fayetteville, Arkansas. The sorority house is planned to be a three (3) story structure, with a partial basement. Through discussions with the Client, it is understood that the partial basement is to be located in the west "wing" of the house and has a planned FFE of 1,380.5 feet. The ground-floor level throughout the remainder of the structure is planned to have an FFE of 1,394.5 feet. It is understood that the basement portion of the structure is planned to be constructed of concrete and steel elements, while the upper levels are to be timber-framed. Slab-on-grade constructure is understood to be utilized on the "ground levels," while a slab-on-deck is planned to be implemented on the main level above the basement.

Structural loading conditions were not available at the time of preparing this report; however, it is anticipated that maximum column and wall loads will not exceed 100 kips and three (3) klf.

A section view of the planned house is provided in Figure 5 below for reference.

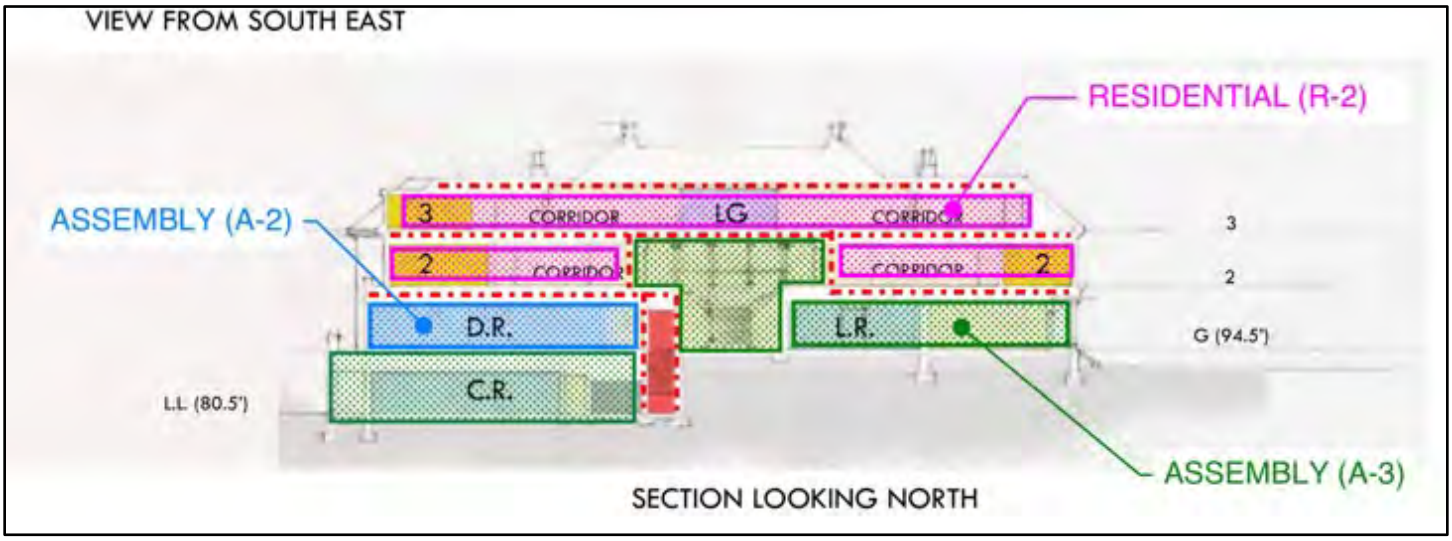


Figure 5: Section View of the Alpha Phi Sorority House
The image was provided by WER Architects on March 14th, 2025

In addition to the chapter house, it is understood that a parking area is planned to be constructed in the northern portion of the lot. As the final pavement types are not known at the time of preparing this report, considerations for the use of both flexible asphalt and rigid concrete pavement have been provided for the consideration of the Design Team.

The purpose of this investigation was to obtain adequate subsurface information from which to provide recommendations and considerations for the planned structure and associated pavement improvements. Those recommendations and considerations are presented in the following sub-sections of this report.

10.1 Initial Site Preparation

As previously described in the Stratum I summary (*Section 9.1*), the project borings encountered topsoil, gravel, and asphalt pavement materials across the surface of the project site. The topsoil was encountered within project borings B-01, B-04, and B-05, with thicknesses ranging from approximately eight (8) to 10 inches. The gravel surface materials were encountered within project borings B-02 and B-06, with thicknesses of approximately four (4) and six (6) inches, respectively. Asphalt pavement with an underlying base course was observed to be present within project borings B-03 and B-07. The asphalt materials were observed to have thicknesses ranging from one (1) to three (3) inches, while the underlying base was observed to have a thickness of approximately one (1) inch in each occurrence.

Additionally, existing residential structures (single-family and multi-family), retaining walls, and mature trees were observed to be present across the site. The depth and extent of the foundations relevant to these structures/retaining walls and the root systems relevant to these trees are unknown at the time of preparing this report.

MCE recommends that all Stratum I surface materials, as well as all organics, existing structure/foundation elements, residential utilities, and otherwise deleterious materials, be removed full-depth as part of the initial site preparation.

MCE recommends that the Contractor carry an initial budget for the removal of a minimum of one (1) foot of surface materials to fully remove the known Stratum I materials from the project site. An additional allowance should be carried to fully remove any remnants of the previous developments and deeper tree root-masses that may be encountered during construction.

10.2 Site Grading Considerations

The recommendations contained herein are based on the finished floor elevations provided by the Design Team, as well as the anticipation that the finished grades within the parking area will remain near the existing site elevations. As previously noted, it is understood that the partial basement in the west wing has a planned FFE of 1,380.5 feet, while the ground-floor level for the remainder of the house is planned to have an FFE of 1,394.5 feet.

For the purposes of this report, “suitable” materials refers to subgrade materials that MCE believes will pass proof rolling operations in their current state. Based on the anticipated loading conditions for the structure, these materials are generally anticipated as being adequate for the placement of select fill and may be adequate for the direct bearing of foundation elements on a case-by-case basis. Specific recommendations for structure foundations and pavement subgrade materials have been provided in later sections of this report.

Should weather patterns and site conditions at the time of construction be similar to those experienced during this investigation, then it is anticipated that the subsurface materials within the west wing of the building footprint will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 0.2 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from 1,376.4 to 1,387.6 feet), based on the materials encountered in project borings B-02, B-03, and B-07. It is anticipated that the subsurface materials within the central and eastern wing of the building footprint will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 0.5 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from approximately 1,384.8 to 1,390.7), based on the findings of project borings B-05 and B-06.

It is anticipated that subsurface materials within the project pavement dimensions will be in suitable condition for the placement of select fill beginning at depths ranging from approximately 2.3 to 3.7 feet below the existing surface elevations (suitable at elevations ranging from approximately 1,378.5 to 1,387.5 feet), based on the findings of project borings B-01 and B-04.

It should be noted that where low-consistency Stratum III materials were encountered near the surface of the project borings, reworking of these materials through scarifying and recompacting may reduce the amount of necessary undercut below select project elements. Further discussion on the specific recommendations pertaining to the structure footprint and pavement dimensions are provided in *Sections 10.6 and 10.9,* respectively.

Specific care should be taken by the Contractor to prevent excessive saturation of the subgrade materials exposed during site stripping and excavations as the in-situ soils, particularly Stratum II and Stratum IV, are susceptible to reduced shear strengths when exposed to increased moisture conditions. This can be achieved by providing positive drainage during construction and covering with select fill material soon after exposure, where applicable.

Due to the potential variability in subsurface conditions below the structure, it is recommended that all structural elements, including shallow foundations, slabs-on-grade, and project pavement elements, bear on a minimum of one (1) foot of imported select fill material placed on suitable in-situ materials.

However, the Contractor should carry an allowance for the placement of up to two (2) feet of imported select fill below these elements in the event that unforeseen conditions are encountered during construction. The amount of necessary imported fill may be reduced based on site conditions at the time of construction. These final recommendations should be made under the direction of the Geotechnical Engineer or his/her representative.

10.2.1 Temporary Slopes During Construction

Excavations should be performed in accordance with the requirements outlined by the Occupational Safety and Health Administration (OSHA) 1926 – Subpart P – Appendix B. Excavated slopes during construction with depths less than 20 feet should be benched or sloped to provide the minimum horizontal-to-vertical (H:V) ratios as noted in Table 6 on the following page.

Table 6: Temporary Slopes During Construction

On-Site Soil Stratum	Material Description	OSHA Soil Type	Maximum Allowable Slopes (H:V)
Stratum II	Fine-Grained Subgrade Materials	Type B Soils	1:1 (45˚)
Stratum III	Coarse-Grained Subgrade Materials	Type B Soils	1:1 (45˚)
Stratum IV	Highly Weathered Shale Materials	Type A Soils *	3/4:1 (53˚)

Note: OSHA Soil Type assignments should be considered preliminary and should be verified at the time of construction, if applicable, by an OSHA-competent person.
* Stratum IV Shale Materials cannot be classified as Stable Rock due to the weathered nature and bedding planes of the encountered materials. These materials may become unstable if excavations experience prolonged exposure to the elements.
** Maximum allowable slopes of 1/2H:1V (63˚) may be utilized for temporary slopes in Type A Soils with excavation depths of 12 feet or less.

Sloping or benching of excavations greater than 20 feet deep shall be designed by a licensed Professional Engineer (PE) prior to excavation. Construction slopes steeper than recommended may be unstable, particularly when introduced to moisture increases during precipitation events. If excavation efforts require deep vertical trenching (deeper than five (5) feet), and the minimum allowable slope ratio is not achievable, then the Contractor must establish a comprehensive Shoring Plan. That Shoring Plan should be reviewed and stamped by a licensed PE prior to excavation.

10.3 Subgrade Verification Method

Following stripping and initial grading, the development area subgrade should be initially evaluated by the Geotechnical Engineer or his/her representative. All subgrade materials should be proof-rolled with a tandem-axle fully-loaded dump truck weighing approximately 60,000 pounds, or equivalent construction equipment.

The proof-rolling should be observed by the Geotechnical Engineer or his/her representative to verify and document suitable subgrade conditions. Alternate means of subgrade verification may be conducted should proof-rolling not be feasible within excavation or undercut dimensions. The implemented means of verification should be under the direction of the Geotechnical Engineer. Any soft and/or yielding subgrade areas encountered should be repaired by undercutting and backfilling with select fill material. These materials should then be subsequently evaluated by the Geotechnical Engineer or his/her representative for approval.

It is highly recommended that the structure footprint and project pavements are evaluated immediately following initial site stripping and grading to reduce unnecessary undercut.

10.4 Rock Excavation Considerations

As noted in *Section 4.2*, auger refusal materials in the form of limestone and shale were encountered by project borings B-02 through B-07 at depths ranging from approximately 10.0 to 15.0 feet below the existing surface elevations (elevations ranging from approximately 1,367.1 feet to 1,378.8 feet).

The depth of auger refusal materials (Stratum V limestone and Stratum VI competent shale) within the dimensions of the west wing in relation to the planned FFE may be referenced in Appendix D on Plate 19. The depth of auger refusal materials (Stratum V limestone) within the dimensions of the central portion of the structure and the east wing in relation to the planned FFE may be referenced on Plate 20.

As may be observed, it is likely that these rock materials may be encountered within footing and utility excavations relevant to the western portion of the structure, but it is not likely that these materials will be encountered in excavations within the central and eastern portion of the structure.

Additionally, it is not anticipated that these rock materials will be encountered during the construction of the parking area.

Should they be encountered during the construction of the west wing, Stratum IV highly weathered shale materials are also likely to result in difficult excavation conditions and may require the use of medium to heavy-duty (30,000 pounds or greater) equipment to remove. This condition is anticipated to occur in the vicinity of project boring B-03.

It is recommended that the Contractor budget for the use of hammer-hoe attachments to conduct vertical excavations through the Stratum V/VI materials. Should the Contractor determine it a reasonable method for rock removal, ripper teeth utilized on a large bulldozer (80,000 pounds or greater) are also anticipated as being capable of removing the Stratum V/VI materials.

10.5 General Foundation Recommendations

The foundations relevant to the planned chapter sorority house should be sized to meet three (3) conditions. First, the maximum stresses imposed on the foundation strata should not exceed the allowable bearing pressures as determined by the shear strength properties of the bearing strata. Secondly, foundations should be designed to limit the maximum anticipated total and differential settlement to magnitudes that will neither damage nor impair the use of the structures. Finally, the foundation systems must also be designed to resist the anticipated lateral or overturning forces during the most critical loading conditions, including earthquake loadings. These factors, as well as construction considerations related to the existing soil and ground conditions, were influential in the preparation of the recommendations presented hereinafter.

10.6 Shallow Foundation Recommendations

Based on the provided information, current project scope, and encountered subgrade materials, it is recommended that a shallow foundation system composed of continuous and/or individual (spread) footings will be suitable for the support of the planned structure. The recommendations contained herein are based on the anticipation that weather conditions at the time of construction are similar to those experienced at the time of this investigation.

As previously noted, the recommendations contained herein are based on the understanding that the partial basement in the west wing has a planned FFE of 1,380.5 feet, while the ground-floor level for the remainder of the house is planned to have an FFE of 1,394.5 feet. Additionally, these recommendations are based on the anticipation that the structure footings will bear 2.5 feet below the planned FFEs, allowing for a six (6) – inch thick slab-on-grade and two (2) – foot deep footings (adequate to protect against frost-heave in the project area). As such, it is anticipated that the west wing footings will bear at an elevation of approximately 1,378.0 feet and the central area/east wing footings will bear at an elevation of approximately 1,392.0 feet.

Based on the subsurface materials encountered **within the west wing of the planned sorority chapter house, it is recommended that the footings within the partially below-grade basement bear on a minimum of one (1) foot of properly placed, moisture conditioned select fill, meeting the requirements outlined in *Section 10.11* of this report, with a budget for up to two (2) feet of imported select fill to be placed below the footing dimensions where required**. This one (1) foot of imported fill is intended to account for variability in subsurface conditions below the footings (which may include Stratum III SM materials, Stratum IV highly weathered shale, and Stratum V limestone) and to minimize the effects of differential settlement in this portion of the structure. Based on the anticipated FFE and footing dimensions, this one (1) foot of imported fill should initially be placed at an elevation of 1,377.0 feet. Additional undercut on the order of one (1) foot (two (2) feet total below the anticipated bottom of footing elevation) may be required in portions of the west wing, such as in the vicinity of project boring B-02, due to the presence of low-consistency materials. As noted in *Section 10.2,* reworking of the in-situ Stratum III materials through scarifying and recompacting may reduce the amount of undercut necessary within the structure dimensions.

Based on the subsurface materials encountered **within the central and eastern wing of the planned structure, it is recommended that the footings bear on a minimum of one (1) foot of imported select fill**. As with the western wing, this minimum select fill placement is intended to account for variability in the subsurface conditions within the structure footprint. Due to the anticipated fill placement (approximately 3.5 feet of fill to the bottom of footings within B-05 and approximately 0.8 feet of fill to the bottom of footings within B-06), it is likely that this condition will be satisfied within the planned earthwork operations. However, **it is recommended that the Contractor carry an allowance for up to two (2) feet of undercut to occur within the central and eastern portions of the structure**, in the event that areas of instability are encountered at the time of construction. This undercut allowance is intended to be an average over this portion of the structure footprint and may vary in specific occurrences.

Final recommendations pertaining to the placement of imported fill materials beneath the foundation elements should be made based on final project plans and site conditions at the time of construction. Footings bearing on a minimum of one (1) foot of properly placed select fill materials meeting the requirements outlined in this report placed on suitable in-situ materials may utilize safe allowable bearing capacities of 2,300 pounds per square foot (psf) for continuous footings and 2,500 psf for spread footings.

The allowable bearing capacities provide a minimum factor of safety of three (3) and were calculated using a minimum footing width of two (2) feet, a minimum footing thickness of one (1) foot, and a minimum footing depth of two (2) feet below exterior ground elevations.

The total long-term foundation settlement for footings bearing on properly placed select fill material with the assumed dimensions and loading is anticipated to be approximately ¾-inch. The maximum differential settlement between footings is anticipated to be on the order of ½-inch between individual footings or along a 40-foot span for continuous footings.

It is highly recommended that the subgrade within the structure footprint be evaluated for stability immediately following initial site stripping and grading in an effort to reduce unnecessary undercut operations. Subgrade stability verification should be performed in accordance with *Section 10.3* of this report.

10.7 Structure Slab-on-Grade

Slab-on-grade construction may be utilized for the planned sorority chapter house, provided a minimum four (4) inch cushion of sand, crushed stone, or gravel is placed below the slab areas with a vapor barrier directly below the concrete. It is recommended that a minimum of one (1) foot of select fill material is properly placed beneath the slab dimensions to provide adequate subgrade support and stable under-slab conditions. This recommendation will likely be satisfied during initial earthwork operations required to allow for the placement of a minimum of one (1) foot of select fill beneath the structure foundations.

The entirety of the slab subgrade area is recommended to be verified during construction by proof-rolling as previously described in *Section 10.3* of this report.

10.8 Lateral Earth Pressures

Any earth-retaining structure implemented as part of the Alpha Phi Sorority House project, including the basement walls, should be designed to resist the minimum equivalent fluid weights provided in Table 7 on the following page.

The recommended minimum factor of safety against sliding and overturning is 1.5 and 2.0, respectively. **The provided lateral earth pressures assume a drained condition for the backfill material.** To achieve a drained condition, retaining structures should be backfilled using a free-draining granular material and be provided with thru-drains or a gravity trench drain system graded to daylight for the release of any hydrostatic pressure that may develop.

Alternate means of drainage may be required if daylighting is not an option; those alternate means would need to be discussed and approved by the Design Team. Should a drained condition for the backfill material not be achievable, then it is recommended that further coordination occur to ensure that proper “undrained” values are utilized for the design of the earth-retaining structures.

The values provided in Table 7 for No. 57 or No. 67 crushed stone gravel assume a 1H:1V maximum backfill slope from the heel of the retaining wall foundation. If a vertical “chimney drain” is provided by the No. 57 or No. 67 stone, then the values for on-site soils should be used based on proximity and relevancy to the material behind the gravel.

Table 7: Lateral Earth Pressures

Soil/Backfill Type	Moist Unit Weight (lbs/ft^3)	Friction Angle φ (^{0})	Equivalent Fluid Pressure (lbs/ft^3)		
			Active	Passive	At-Rest
On-site Soils Stratum II	105	18	55	199	73
On-site Soils Stratum III	120	27	45	320	66
On-site Soils Stratum IV	125	30	33	217	63
Select Fill Material (GC, GM, SC)	120	28	43	332	64
No. 57 or No. 67 Stone	95	35	25	350	41

A coefficient of friction of 0.40 may be used provided the retaining structure is supported on a minimum of four (4) inches of placed and compacted Class 7 Base Course material. A friction value of 0.35 may be used provided the retaining structures are supported directly on select fill material or on-site soils.

10.9 Project Pavement Recommendations

Site grading for the planned pavement improvement areas should initially consist of stripping all Stratum I materials, followed by proof-rolling as previously described. Subgrade preparation and proof rolling should follow the same procedure as described in the *Subgrade Verification* section of this report. Based on the data obtained from this investigation, it is anticipated that materials in suitable condition for the placement of select fill within the pavement improvement areas are present beginning at depths ranging from approximately 2.3 to 3.7 feet below the existing surface elevations (elevations ranging from approximately 1,378.5 to 1,387.5 feet).

As such, **it is recommended that the Contractor budget for an average undercut of three (3) feet below the existing surface elevations within the pavement dimensions.** Specific guidance relating to the undercut within the parking and access drives should be as directed by the Geotechnical Engineer or his/her representative at the time of construction, based on the results of proof-rolling operations.

It is recommended that all project pavements bear on a minimum of one (1) foot of imported select fill. Suitable subgrade conditions should be exposed prior to the placement of select fill materials.

Thickened lifts or “bridging” lifts may be utilized to establish stable subgrade conditions within the pavement areas, should unstable subsurface conditions be encountered during construction. Bridging lifts should only be implemented under the direction of the Geotechnical Engineer or his/her representative. The top eight (8) inches of any thickened lift should be compacted and tested per project specifications. A minimum of one (1) standard lift should be placed above any thickened lift utilized beneath pavement areas.

Select fill and base course material should be placed per the requirements provided in *Section 10.11* of this report. **Bridging lifts should not be utilized beneath any structure-related elements.**

10.10 Minimum Pavement Section Recommendations

The minimum recommended pavement sections provided herein are based on stable select fill material existing beneath the recommended pavement sections. This requirement would be provided by proper placement of approved select fill bearing on suitable on-site materials and verified for stability by proof-rolling within the pavement subgrade dimensions. Minimum pavement sections are recommended to be as shown in Tables 8 and 9 on the following page.

For the recommendations provided in Tables 8 and 9, light-duty pavements are considered to be those pavements with low-volume traffic areas such as pedestrian sidewalks, parking lots, and staging areas. The standard-duty pavements are recommended as performing similarly to a typical city street pavement section with a residential classification. Heavy-duty pavement recommendations are intended to apply to areas subjected to frequent heavy-truck traffic, such as dumpster pads.

Table 8: Minimum Project Pavement Sections – Asphalt

Pavement Type	Pavement Materials	Light Duty	Standard Duty	Heavy Duty
Asphalt Pavement	ACHM Surface Course (1/2")	3"	3"	2"
	ACHM Binder Course (1")	N/A	N/A	3"
	Class 7 Base Course (95% MPD)	6"	8"	8"

Table 9: Minimum Project Pavement Sections – Concrete

Pavement Type	Pavement Materials	Light Duty	Standard Duty	Heavy Duty
Concrete Pavement	Portland Cement Concrete	5"	5"	6"
	Class 7 Base Course (95% MPD)	6"	8"	8"

The pavement sections provided in Tables 8 and 9 should be viewed as minimums and can be increased through the design process by the project Civil Engineer if warranted.

10.11 Select Fill Materials

Any select fill material required for the project is recommended to be an off-site borrow material of locally available silty or clayey chert gravel or clayey sand meeting Unified Soils Classification as a GM, GC, or SC material and having a Plasticity Index of 35 or less, a Liquid Limit of 55 or less, a minimum of 30% retained on the ¾-inch sieve and a maximum of 35% passing the No. 200 sieve. All fill and backfill should be placed in horizontal lifts.

When placing fill next to existing slopes, the slope face should be stripped of all vegetation and the face "benched" to allow the placement of horizontal lifts and bonding to the slope face. Table 10 below provides the recommended compaction parameters for select fill and Class 7 base course to be used on the project

Any material to be used as a select fill on the project should be reviewed and approved by the Geotechnical Engineer.

Table 10: Compaction Requirements

Material Type	Test Standard	Minimum Dry Density (%)	Optimum Moisture Range (%)
Select Fill (Structure)	ASTM D698 / AASHTO T99	98	-3% to +3%
Select Fill (Pavements)	ASTM D698 / AASHTO T99	95	-3% to +3%
Base Course	ASTM D1557 / AASHTO T180	95	Near Optimum

11.0 Construction Materials Testing and Special Inspections

Construction materials testing and special inspection services are recommended to be provided by MCE to provide consistency with the recommendations in this report and the documentation of those recommendations being implemented during construction. Testing of the earthwork, concrete, paving, structure, and other phases is recommended to be conducted and documented during construction to assure the Owner and Engineer that the construction complies with the specifications. In particular, field verification of earthwork operations will be required to confirm the recommendations contained herein. Additionally, all trenching and excavations should be conducted following the current Arkansas State Law and Occupational Safety and Health Administration (OSHA) guidelines and requirements.

12.0 Limitations and Reserved Rights

The recommendations and conclusions made in this report are based on the assumption that the subsoil conditions do not deviate appreciably from those disclosed in the subsurface exploration. Should significant subsoil variations or undesirable conditions be encountered during construction that are not described herein, the Geotechnical Engineer reserves the right to inspect these conditions for the purpose of reevaluating this report. A review of the final construction plans and specifications by this office is encouraged to ensure compliance with the intent of these recommendations.

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Appendix A: BORING LAYOUT



Prepared For:
Alpha Phi International Fraternity
Ms. Kimberly Roberson
1985 S. Josephine Street
Denver, Colorado 80210

PROJECT NUMBER

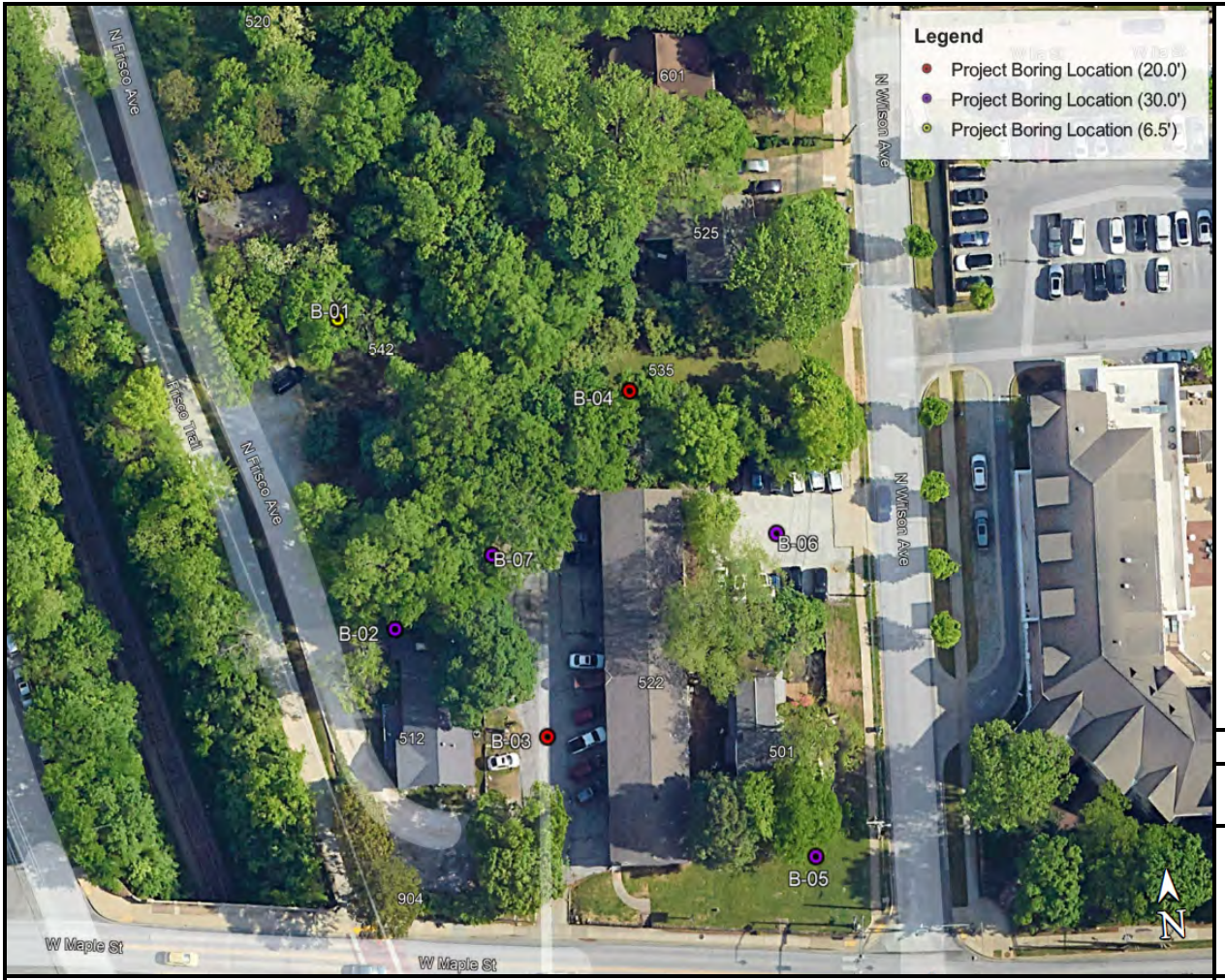
25-3804

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Alpha Phi Sorority House

Fayetteville, Arkansas

PLATE 1



Prepared For:
Alpha Phi International Fraternity
Ms. Kimberly Roberson
1985 S. Josephine Street
Denver, Colorado 80210

PROJECT NUMBER

25-3804

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Alpha Phi Sorority House

Fayetteville, Arkansas

PLATE 2

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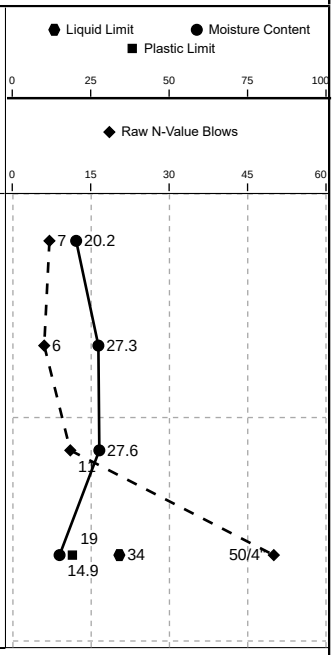
Appendix B: BORING LOGS

UofA - Alpha Phi Sorority House

Soil Boring: B-01

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07083, -94.16679
Date Started:	02/28/2025	Date Completed:	02/28/2025	Ground Elev.:	1382.2'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Sample Graphic	Graphic Log	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
				TOPSOIL: (8") 0.7		
	1380			(SM) SILTY SAND: Dark Brown; Loose; Low to Moderate Plasticity; Moist	S1	3-2-5 (7)
					S2	7-2-4 (6)
				3.7		
5				(SC) CLAYEY SAND WITH GRAVEL: Light Brown, Light Gray; Medium Dense; Low to Moderate Plasticity; Moist	S3	3-2-9 (11)
				Very Dense; Sandstone Fragments; Little Gravel; Some Sand; Some Fines	S4	20-19-50/4" (50/4")
				6.5		
				End of Boring		



Boring Date: **02/28/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-01

UofA - Alpha Phi Sorority House

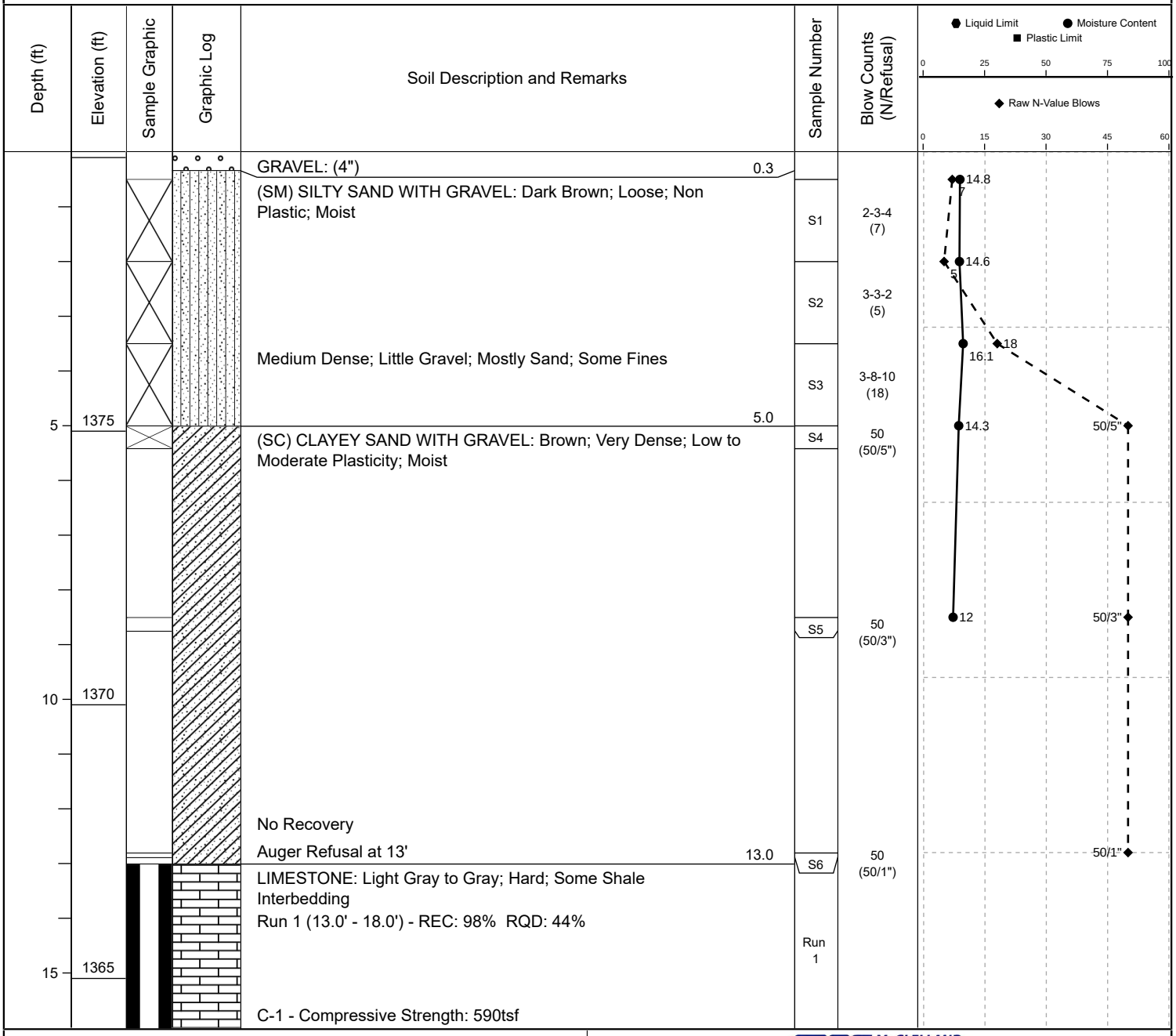
535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-02

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07049, -94.16674
Date Started:	03/05/2025	Date Completed:	03/05/2025	Ground Elev.:	1380.1'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE



Boring Date: **03/05/2025**
Field engineer/Technician: **C. Chiddister**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-02

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-02

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07049, -94.16674
Date Started:	03/05/2025	Date Completed:	03/05/2025	Ground Elev.:	1380.1'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
		LIMESTONE: Light Gray to Gray; Hard; Some Shale Interbedding	Run 1	
		17.5		
		SHALE: Light Gray to Gray; Moderately Hard		
		Run 2 (18.0' - 23.0') - REC: 100% RQD: 30%		
20	1360	C-2 - Compressive Strength: 75tsf	Run 2	
		Run 3 (23.0' - 28.0') - REC: 100% RQD: 87%		
		C-3 - Compressive Strength: 130tsf		
25	1355	Hard	Run 3	
		Run 4 (28.0' - 30.0') - REC: 87% RQD: 80%		
		C-4 - Compressive Strength: 145tsf	Run 4	
30		30.0		
		End of Boring		

Liquid Limit ● Moisture Content ■ Plastic Limit

0 25 50 75 100

◆ Raw N-Value Blows

0 15 30 45 60

Boring Date: **03/05/2025**
Field engineer/Technician: **C. Chiddister**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-02

UofA - Alpha Phi Sorority House

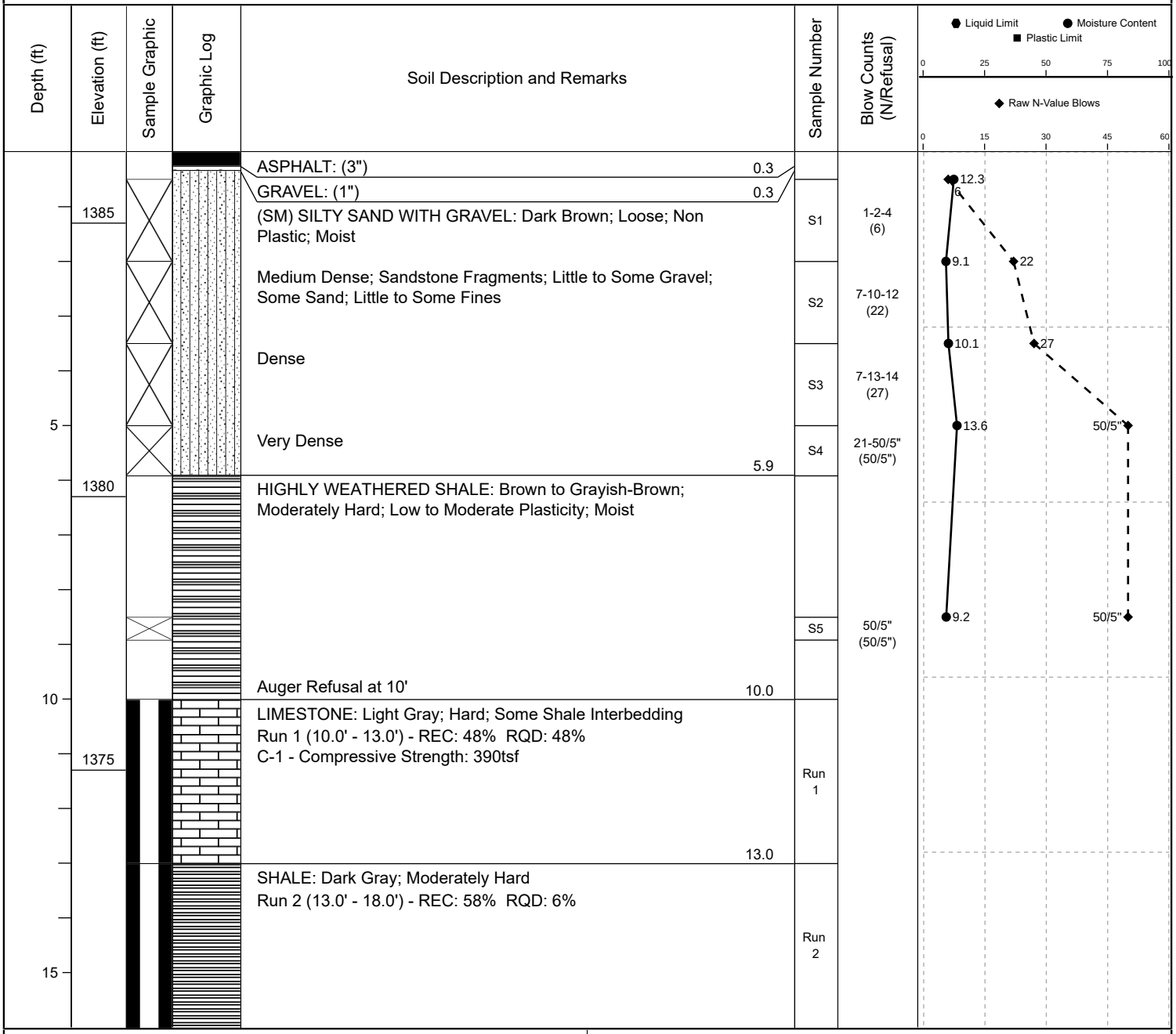
535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-03

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07032, -94.16652
Date Started:	02/28/2025	Date Completed:	02/28/2025	Ground Elev.:	1386.3'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE



Boring Date: **02/28/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-03

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-03

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07032, -94.16652
Date Started:	02/28/2025	Date Completed:	02/28/2025	Ground Elev.:	1386.3'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Sample Graphic	Graphic Log	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
				SHALE: Dark Gray; Moderately Hard C-2 - Compressive Strength: 35tsf	Run 2	
				Run 3 (18.0' - 23.0') - REC: 100% RQD: 70%		
20	1365			Very Hard C-3 - Compressive Strength: 400tsf	Run 3	
				23.0 End of Boring		

Liquid Limit ● Moisture Content ■ Plastic Limit

0 25 50 75 100

◆ Raw N-Value Blows

0 15 30 45 60

Boring Date: **02/28/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-03

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

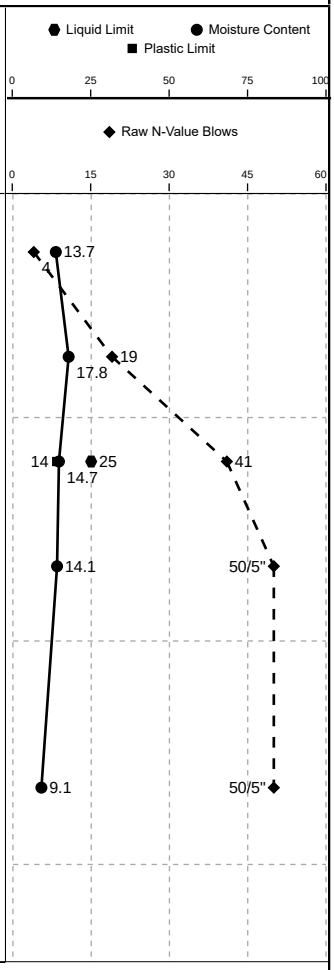
Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-04

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07072, -94.16637
Date Started:	02/28/2025	Date Completed:	02/28/2025	Ground Elev.:	1389.8'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
		TOPSOIL: (10") 0.8		
		(SM) SILTY SAND: Dark Brown; Loose; Non Plastic; Moist 2.3	S1	4-2-2 (4)
		(CL) SANDY LEAN CLAY: Brown; Very Stiff; Low Plasticity; Moist	S2	3-5-14 (19)
5	1385	Hard; Sandstone Fragments; Few Gravels; Some Sand; Mostly Fines	S3	3-17-24 (41)
			S4	10-50/5" (50/5")
		8.5		
10	1380	(SM) SILTY SAND WITH GRAVEL: Brown; Very Dense; Non Plastic; Moist	S5	50/5" (50/5")
		Auger Refusal at 11' 11.0		
		End of Boring		



Boring Date: **02/28/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

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Log of Soil Boring: B-04

UofA - Alpha Phi Sorority House

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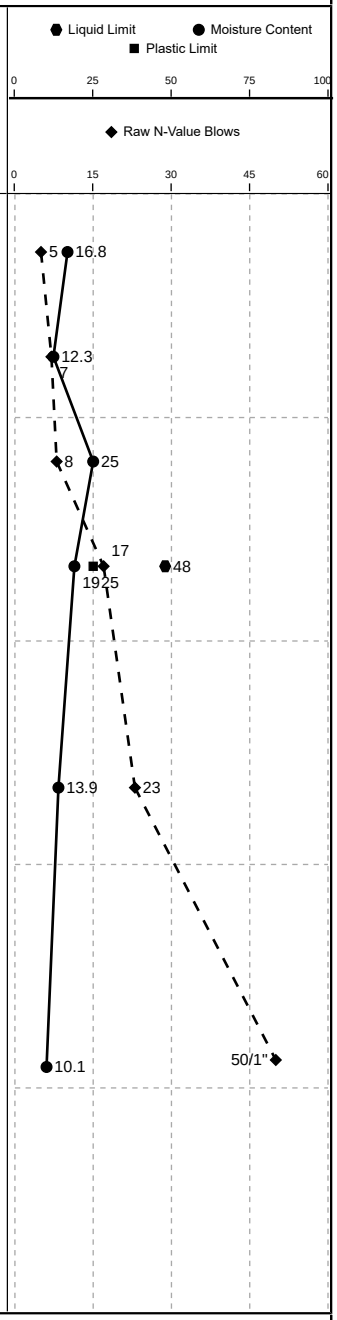
Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-05

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07014, -94.16615
Date Started:	02/27/2025	Date Completed:	02/27/2025	Ground Elev.:	1388.5'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
		TOPSOIL: (10")		
		0.8		
		(CL) LEAN CLAY: Brown; Medium Stiff; Low to Moderate Plasticity; Moist	S1	2-2-3 (5)
		Stiff	S2	2-3-4 (7)
	1385		S3	2-4-4 (8)
5		Light Brown; Very Stiff; Trace Gravel; Little Sand; Mostly Fines	S4	5-8-9 (17)
	1380	8.5		
		HIGHLY WEATHERED SHALE: Light Brown to Grayish-Brown; Soft; Low to Moderate Plasticity; Moist	S5	10-15-8 (23)
10		Limestone Fragments; Hard; Auger Refusal at 12.5'		
		12.5	S6	50/1" (50/1")
		SHALE: Dark Gray; Soft		
	1375	Run 1 (12.5' - 13.0') - REC: 0% RQD: 0%	Run 1	
		13.0		
		LIMESTONE: Light Gray to Gray; Hard		
		Run 2 (13.0' - 18.0') - REC: 51% RQD: 40%		
		C-1 - Compressive Strength: 700tsf	Run 2	
15		15.0		
		SHALE: Dark Gray; Soft		



Boring Date: **02/27/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-05

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-05

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07014, -94.16615
Date Started:	02/27/2025	Date Completed:	02/27/2025	Ground Elev.:	1388.5'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
		SHALE: Dark Gray; Soft	Run 2	
	1370	Run 3 (18.0' - 23.0') - REC: 20% RQD: 0%		
20			Run 3	
		Moderately Hard		
	1365	Run 4 (23.0' - 28.0')- REC: 98% RQD: 45%		
25		Hard	Run 4	
		C-2 - Compressive Strength: 360tsf		
		28.0		
		End of Boring		

Liquid Limit ● Moisture Content ■ Plastic Limit

0 25 50 75 100

◆ Raw N-Value Blows

0 15 30 45 60

Boring Date: **02/27/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-05

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

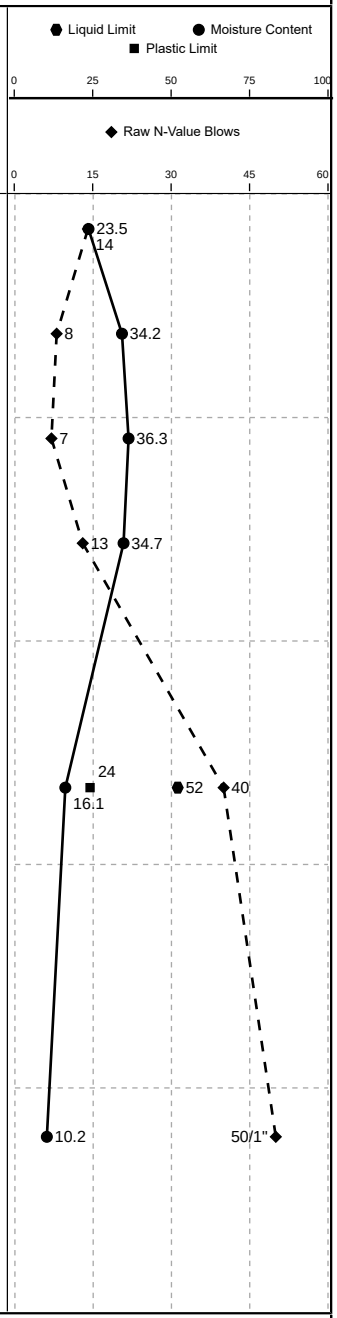
Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-06

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07053, -94.16618
Date Started:	03/03/2025	Date Completed:	03/03/2025	Ground Elev.:	1391.2'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
	1390	GRAVEL: (6") 0.5		
		(SM) SILTY SAND WITH GRAVEL: Brown; Medium Dense; Non Plastic; Moist	S1	17-9-5 (14)
		Loose to Medium Dense	S2	4-2-6 (8)
		3.5		
		(CL) LEAN CLAY WITH GRAVEL: Brown; Stiff; Low to Moderate Plasticity; Moist	S3	2-3-4 (7)
5		Very Stiff	S4	2-5-8 (13)
	1385	8.5		
		(CH) HIGHLY WEATHERED SHALE: Light Grayish-Brown; Moderately Hard; Moderate to High Plasticity; Moist; Trace Gravel; Little Sand; Mostly Fines	S5	12-19-21 (40)
10		13.5		
	1380	(SM) SILTY SAND WITH GRAVEL: Brown; Very Dense; Non Plastic; Sandstone Fragments; Moist	S6	50/1" (50/1")
		Auger Refusal at 15' 15.0		
15		LIMESTONE: Light Gray to Gray; Hard; Shale Interbedding	Run 1	



Boring Date: **03/03/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

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Log of Soil Boring: B-06

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-06

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07053, -94.16618
Date Started:	03/03/2025	Date Completed:	03/03/2025	Ground Elev.:	1391.2'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Sample Graphic	Graphic Log	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
				LIMESTONE: Light Gray to Gray; Hard; Shale Interbedding Run 1 (15.0' - 20.0') - REC: 100% RQD: 59% C-1 - Compressive Strength: 510tsf		
				17.0 SHALE: Dark Gray; Moderately Hard to Hard	Run 1	
20				20.0 End of Boring		

Liquid Limit ● Moisture Content ■ Plastic Limit

0 25 50 75 100

◆ Raw N-Value Blows

0 15 30 45 60

Boring Date: **03/03/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

Log of Soil Boring: B-06

UofA - Alpha Phi Sorority House

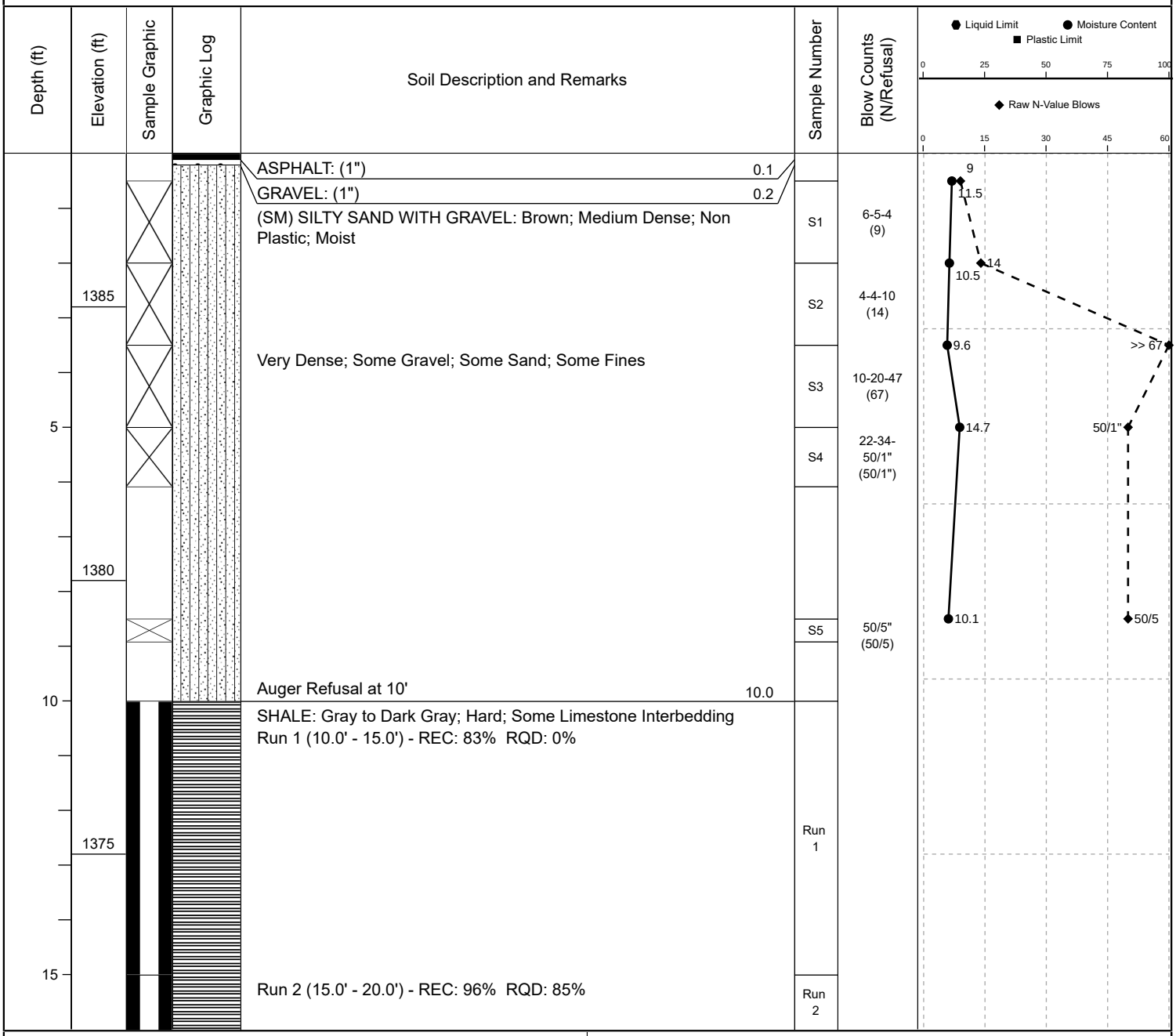
535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-07

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07054, -94.16658
Date Started:	03/03/2025	Date Completed:	03/03/2025	Ground Elev.:	1387.8'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE



Boring Date: **03/03/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

McCLELLAND CONSULTING ENGINEERS, INC.

Log of Soil Boring: B-07

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

UofA - Alpha Phi Sorority House

Soil Boring: B-07

Project Number:	25-3804	Client Name:	Alpha Phi International Fraternity	Coordinates:	36.07054, -94.16658
Date Started:	03/03/2025	Date Completed:	03/03/2025	Ground Elev.:	1387.8'
Drill Rig:	CME-45B	Drilling Method:	Auger	Tooling:	SPT Sampler / NQ2
Hammer Type:	Auto	Hammer Weight:	140	Drilling Firm:	MCE

Depth (ft)	Elevation (ft)	Soil Description and Remarks	Sample Number	Blow Counts (N/Refusal)
		SHALE: Gray to Dark Gray; Hard; Some Limestone Interbedding		
		C-1 - Compressive Strength: 435tsf		
	1370			
		Approximate End of Limestone Interbedding	Run 2	
20		Run 3 (20.0' - 25.0')- REC: 100% RQD: 90%		
		C-2 - Compressive Strength: 100tsf		
	1365		Run 3	
25		Run 4 (25.0' - 30.0') - REC: 100% RQD: 84%		
		C-3 - Compressive Strength: 90tsf		
	1360		Run 4	
30		30.0		
		End of Boring.		

Liquid Limit ● Moisture Content ■ Plastic Limit

0 25 50 75 100

◆ Raw N-Value Blows

0 15 30 45 60

Boring Date: **03/03/2025**
Field engineer/Technician: **J. Ruble**
Driller: **D. Orozco**

Water Level

Depth	Hour	Date
N/A	-	-
N/A	-	-

McCLELLAND CONSULTING ENGINEERS, INC.

Log of Soil Boring: B-07

UofA - Alpha Phi Sorority House

535 N Wilson Ave, Fayetteville, AR 72701, USA

Project No.: 25-3804

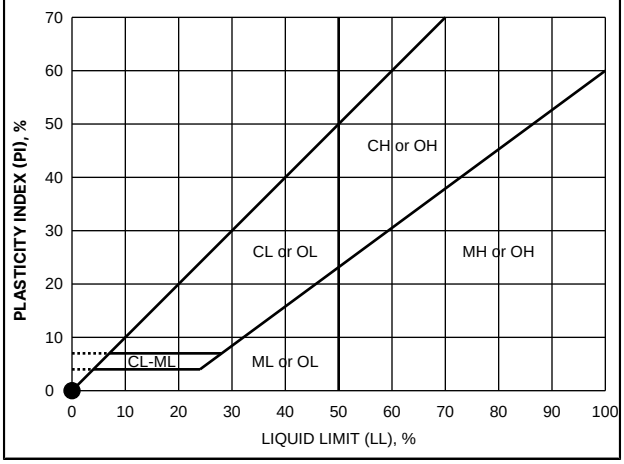
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS	
			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly-graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly-graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly-graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction retained on No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly-graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly-graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly-graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic CLAY
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above 'A'-line)	organic CLAY
			OH (plots below 'A'-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	3 - 8	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 23	15 - 42
Dense	31 - 50	64 - 105	23 - 38	43 - 70
Very Dense	> 50	> 105	> 38	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 2	< 2
Soft	2 - 4	3 - 5	2 - 3	2 - 3
Medium Stiff	5 - 8	6 - 10	3 - 6	4 - 6
Stiff	9 - 15	11 - 20	6 - 12	7 - 13
Very Stiff	16 - 30	21 - 39	12 - 23	14 - 26
Hard	> 30	> 39	> 23	> 26

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

1580 East Stearns Street
Fayetteville, Arkansas 72703
mce.us.com



Appendix C:
LABORATORY RESULTS

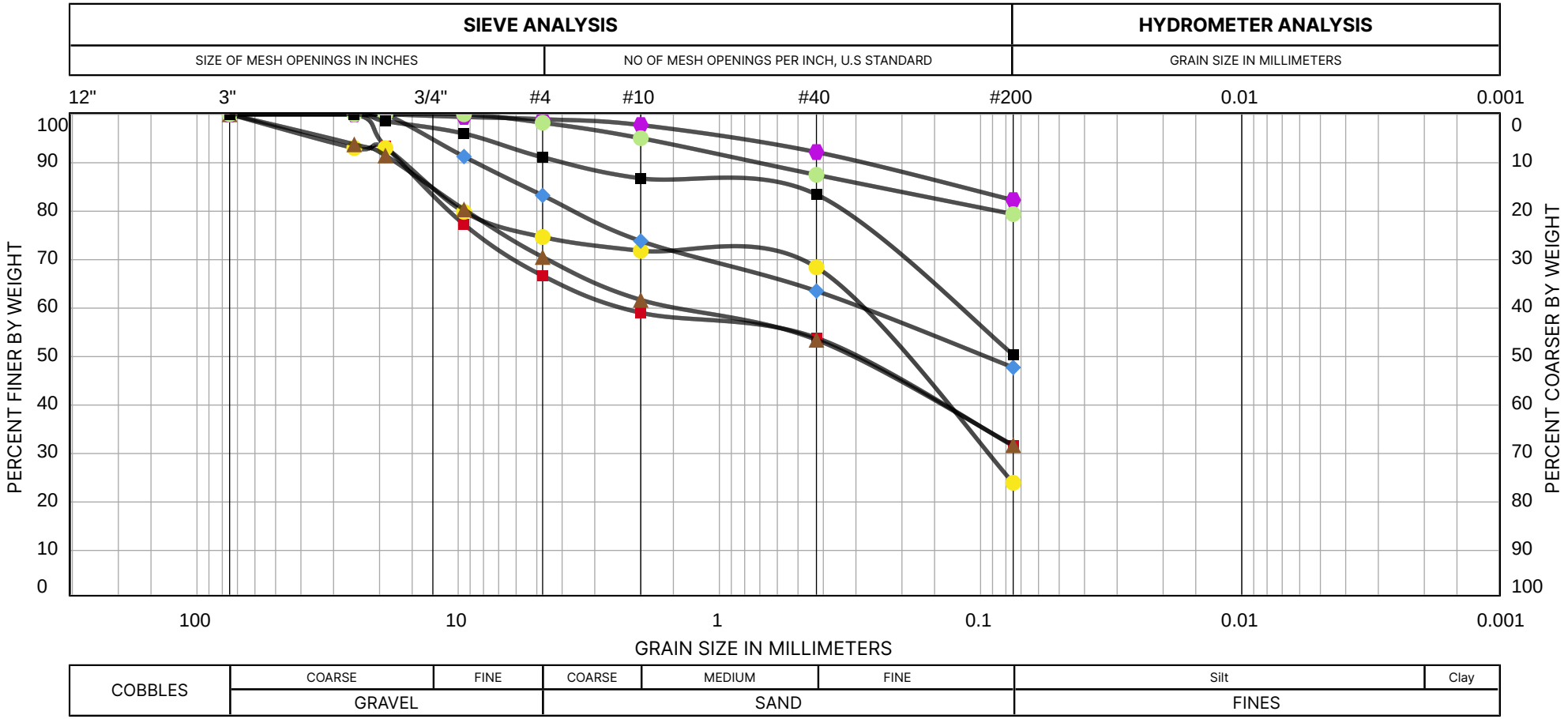
PROJECT UofA - Alpha Phi Sorority House **PROJECT NO.** 25-3804
CLIENT Alpha Phi International Fraternity **LOCATION** Fayetteville, AR

Boring ID	Sample ID	Depth (ft)	Moisture Content (%)	LL	PL	PI	%Gravel	% Sand	% Fines	USCS
B-01	S1	0.67-2.17	20.2							
B-01	S2	2.17-3.67	27.3							
B-01	S3	3.67-5.17	27.6							
B-01	S4	5.17-6.47	14.9	34	19	15	17	36	48	SC
B-02	S1	0.5-2	14.8							
B-02	S2	2-3.5	14.6							
B-02	S3	3.5-5	16.1		NP	NP	25	51	24	SM
B-02	S4	5-5.4	14.3							
B-02	S5	8.5-8.8	12							
B-03	S1	0.5-2	12.3							
B-03	S2	2-3.5	9.1		NP	NP	29	39	32	SM
B-03	S3	3.5-5	10.1							
B-03	S4	5-5.9	13.6							
B-03	S5	8.5-8.9	9.2							
B-04	S1	0.83-2.33	13.7							
B-04	S2	2.33-3.83	17.8							
B-04	S3	3.83-5.33	14.7	25	14	11	9	41	50	CL
B-04	S4	5.33-6.23	14.1							
B-04	S5	8.5-8.9	9.1							
B-05	S1	0.83-2.33	16.8							
B-05	S2	2.33-3.83	12.3							
B-05	S3	3.83-5.33	25							
B-05	S4	5.33-6.83	19	48	25	23	2	19	79	CL
B-05	S5	8.5-10	13.9							
B-05	S6	12.5-12.6	10.1							
B-06	S1	0.5-2	23.5							
B-06	S2	2-3.5	34.2							
B-06	S3	3.5-5	36.3							
B-06	S4	5-6.5	34.7							
B-06	S5	8.5-10	16.1	52	24	28	1	17	82	CH
B-06	S6	13.5-13.6	10.2							
B-07	S1	0.5-2	11.5							
B-07	S2	2-3.5	10.5							
B-07	S3	3.5-5	9.6		NP	NP	33	35	32	SM
B-07	S4	5-6.1	14.7							
B-07	S5	8.5-8.9	10.1							

McCLELLAND CONSULTING ENGINEERS, INC.

GRAIN SIZE DISTRIBUTION TEST RESULTS

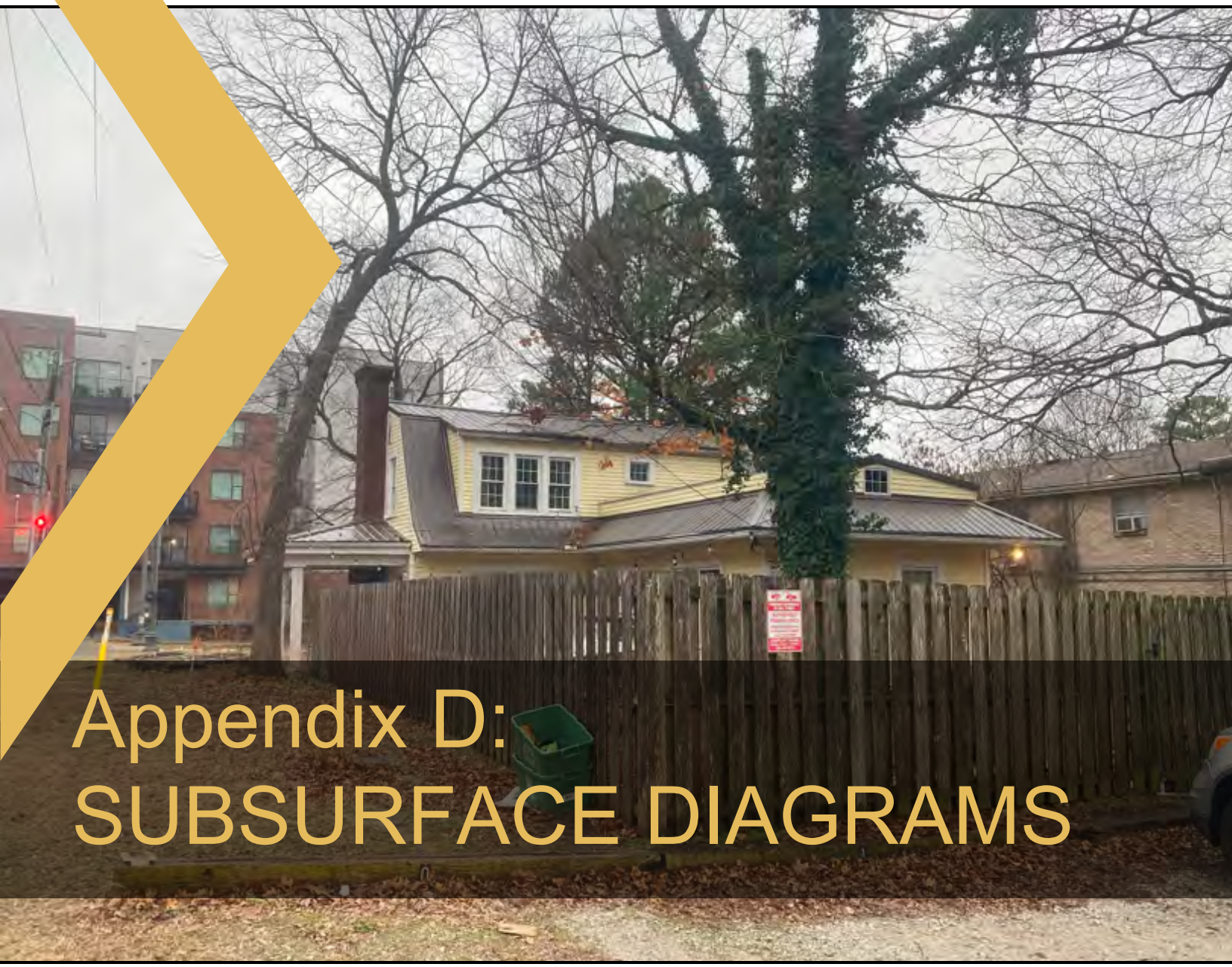
UofA - Alpha Phi Sorority House
Fayetteville, AR



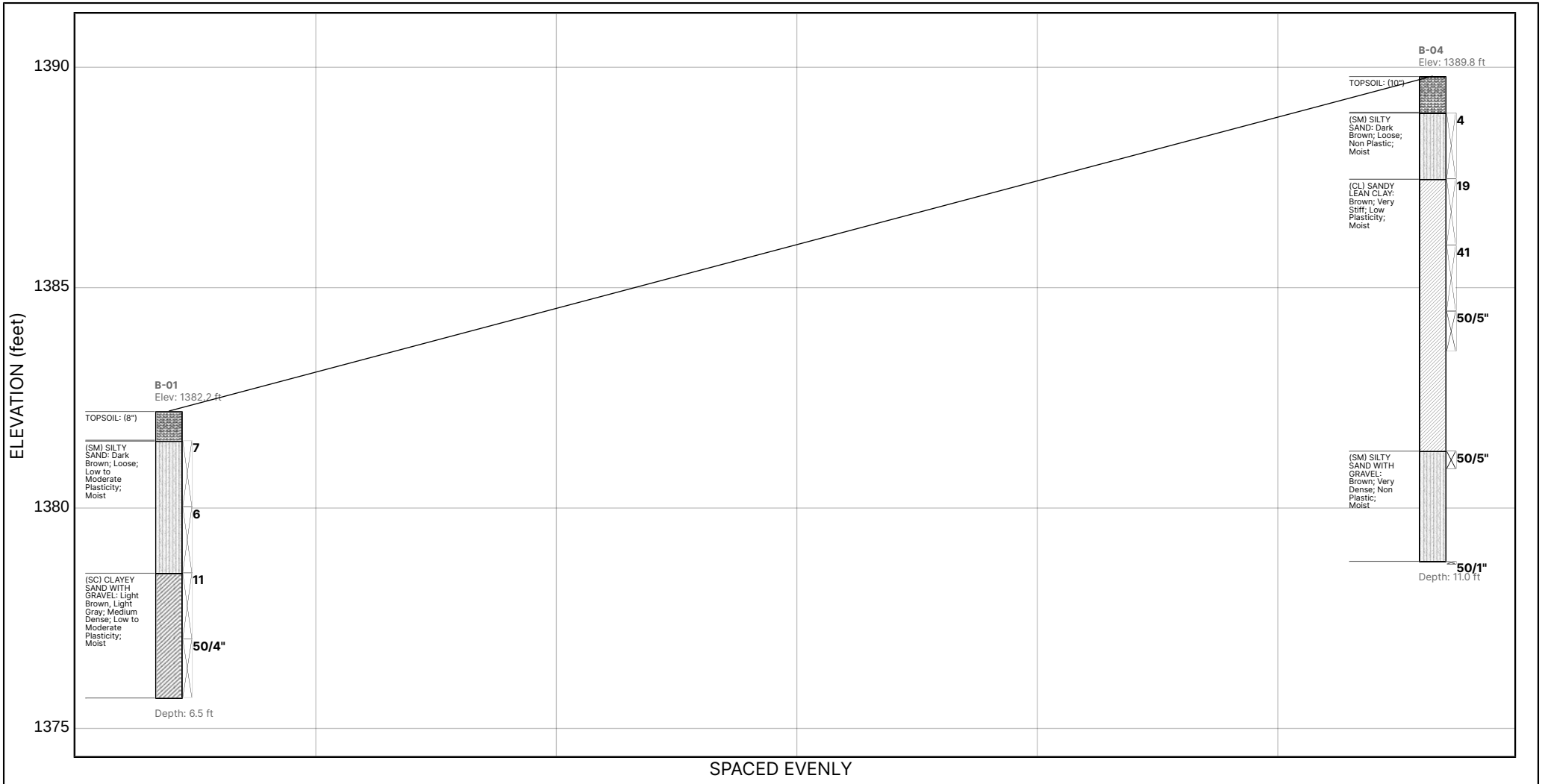
	EXPLORATION	SAMPLE NUMBER	DEPTH	UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) GROUP NAME	USCS SYMBOL	GRAVEL (%)	SAND (%)	FINES (%)	NAT WC (%)	D10	D15	D30	D50	D60	D85	D90	D100
◆	B-01	S4	5.17	CLAYEY SAND WITH GRAVEL	SC	17	36	48	14.9				0.13	0.35	5.82	8.77	50
●	B-02	S3	3.5	SILTY SAND WITH GRAVEL	SM	25	51	24	16.1			0.15	0.32	0.38	13.38	16.94	75
▲	B-03	S2	2	SILTY SAND WITH GRAVEL	SM	29	39	32	9.1				0.38	1.69	13.61	17.8	75
■	B-04	S3	3.83	LEAN CLAY WITH SAND	CL	9	41	50	14.7					0.2	1.16	4.05	50
●	B-05	S4	5.33	LEAN CLAY WITH SAND	CL	2	19	79	19						0.32	0.96	50
⬢	B-06	S5	8.5	FAT CLAY WITH SAND	CH	1	17	82	16.1						0.17	0.35	50
■	B-07	S3	3.5	SILTY SAND WITH GRAVEL	SM	33	35	32	14.7				0.38	2.36	14.27	17.14	50

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

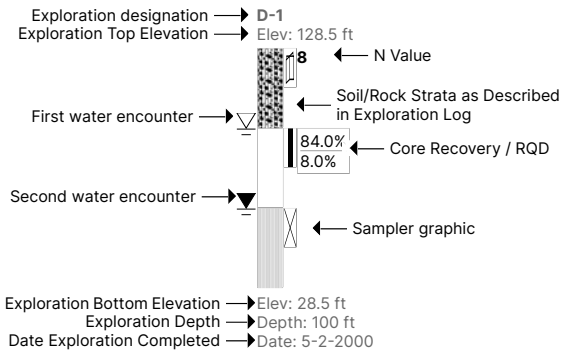
1580 East Stearns Street
Fayetteville, Arkansas 72703
mce.us.com



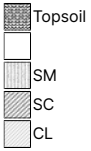
Appendix D:
SUBSURFACE DIAGRAMS



EXPLORATION LOG LEGEND



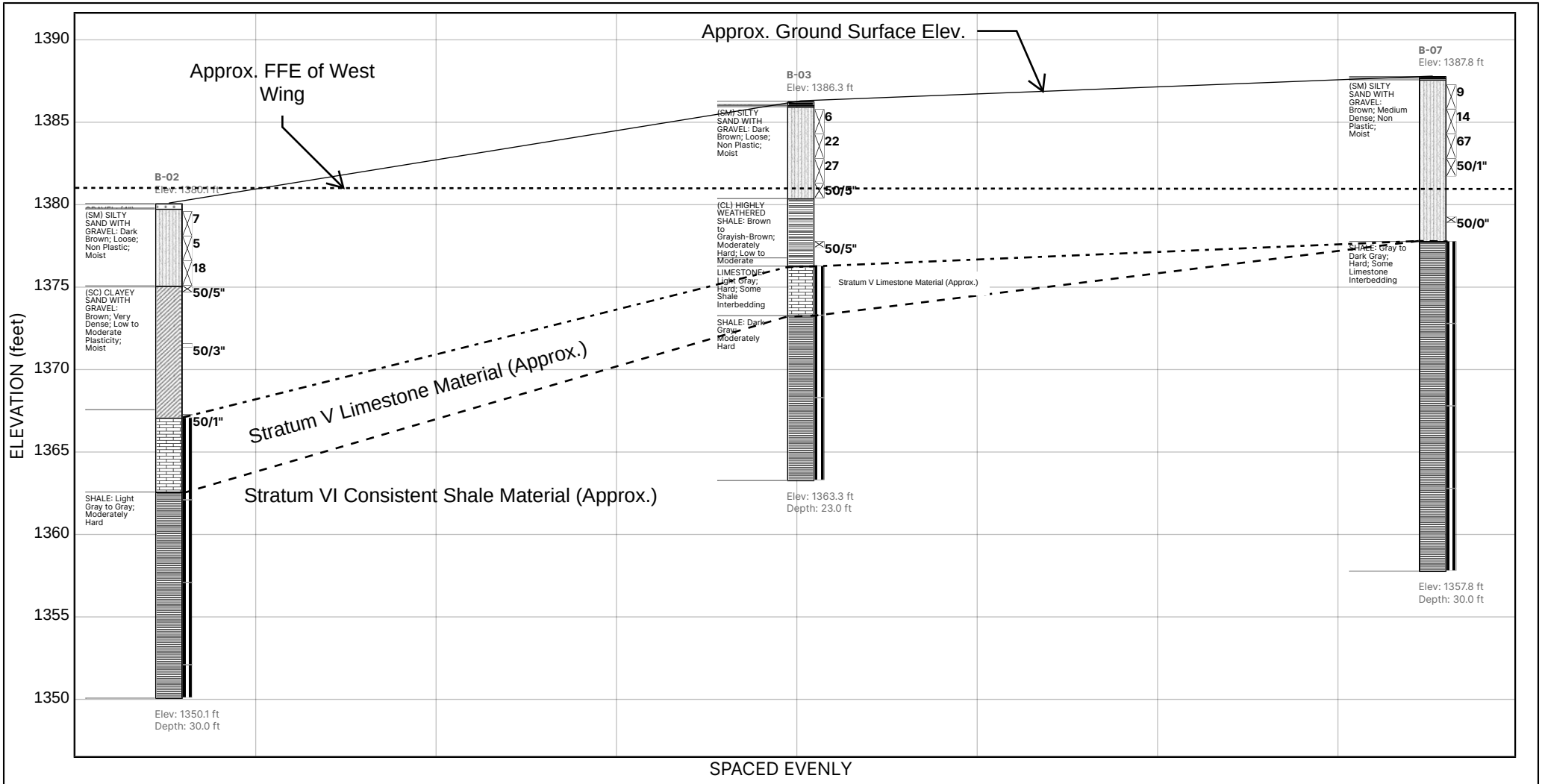
LEGEND KEY



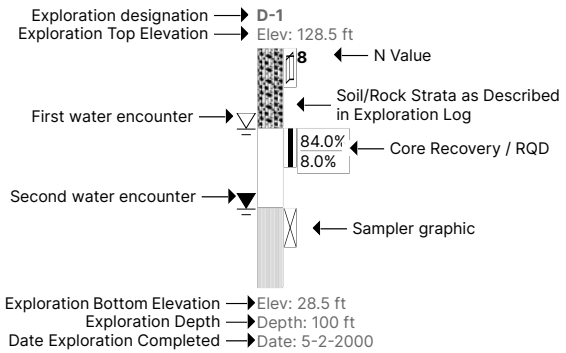
UofA - Alpha Phi Sorority House
36.070655878512326,
-94.1664527552948

CROSS SECTIONS REPORT

McClelland Consulting Engineers, Inc



EXPLORATION LOG LEGEND



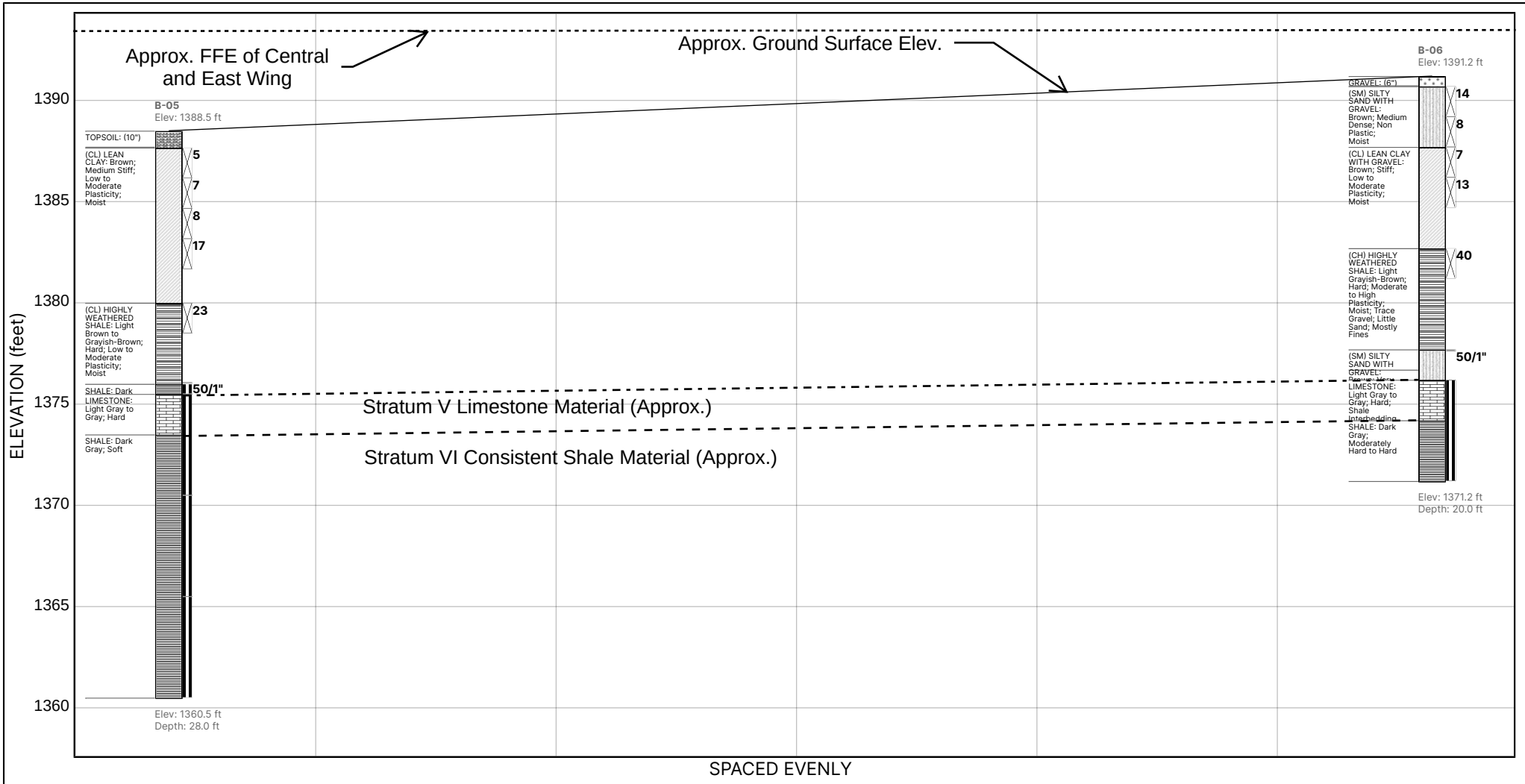
LEGEND KEY

- SC
- SM
- Gravel
- Shale
- Limestone
- Asphalt
- Silty_Clay_Shale
- Asphalt

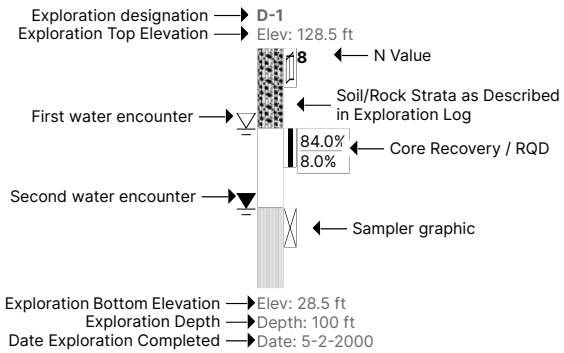
UofA - Alpha Phi Sorority House
36.070655878512326,
-94.1664527552948

CROSS SECTIONS REPORT

McClelland Consulting Engineers, Inc



EXPLORATION LOG LEGEND



LEGEND KEY

- Topsoil
- Silty_Clay_Shale
- CL
- Shale
- Limestone
- Gravel
- SM

UofA - Alpha Phi Sorority House
36.070655878512326,
-94.1664527552948

CROSS SECTIONS REPORT

McClelland Consulting Engineers, Inc

SECTION 00 4500
REPRESENTATIONS AND CERTIFICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Owner-approved version of the AIA Document A201 - 2017 Edition: "General Conditions of the Contract for Construction”

B. Bid Form/Subcontractor Disclosure

C. Form: CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

D. Form: EQUAL OPPORTUNITY POLICY REQUIREMENT FOR CONTRACTORS

E. Form: UA COMBINED CERTIFICATIONS FOR CONTRACTING WITH THE STATE OF ARKANSAS

1.02 REPRESENTATIONS

A. Consistent with A.C.A. § 25-17-101 each Bidder/Proposer is obligated not to discriminate against any qualified employee or qualified applicant for employment because of race, color, creed, national origin, or ancestry and shall include a similar provision in all subcontracts.

B. Consistent with A.C.A. § 19-11-104 each Bidder/Proposer by submitting a response, shall also submit to the Office of State Procurement and the Owner’s Representative the most current equal opportunity policy of the entity or person.

C. Consistent with A.C.A. § 19-11-245 each Bidder/Proposer by submitting a response, represents that the Respondent’s firm is in good standing with the State Procurement Director and is not debarred from consideration for the award of contracts, or facing a suspension from such consideration during an investigation, when there is probable cause for such a debarment.

D. Consistent with A.C.A. § 22-9-204 each Bidder/Proposer by submitting a response, represents that as a prime contractor, the Respondent’s firm shall use no other subcontractors when the subcontractors' portion of the project is fifty thousand dollars ($50,000) or more, except those licensed by the Contractors Licensing Board and qualified in (1) Mechanical, indicative of heating, air conditioning, ventilation, and refrigeration;(2) Plumbing;(3) Electrical; and (4) Roofing.
   1. Specialty contractors and subcontractors shall be licensed in their respective fields where licensure is available. For example, asbestos abatement contractors and consultants must be licensed by the Arkansas Department of Energy and Environment.

E. Consistent with A.C.A. § 22-9-204 each Bidder/Proposer by submitting a response, represents that the Respondent’s firm is in possession of the proper license(s) under the laws and regulations governing the respective trade(s) for which Work is to be self-performed.

F. Consistent with A.C.A. § 4-27-1501 each Bidder/Proposer by submitting a response, represents that the Respondent’s firm has the Authority to Transact Business in the State of Arkansas. A foreign corporation may not transact business in this state until it obtains a Certificate of Authority from the Secretary of State.

G. Consistent with A.C.A. § 22-9-203, no contract providing for the making of major repairs or alterations, for the erection of buildings or other structures, or for making other permanent improvements shall be entered into by the state, any agency of the state, any county, municipality, school district, or other local taxing unit with any contractor in instances where all estimated costs of the work shall exceed the sum of seventy-five thousand dollars ($75,000) unless the bid documents contain statements which encourage the participation of small and veteran-owned business enterprises.
   1. UA encourages all small and veteran-owned business enterprises to submit competitive sealed bids and proposals for university projects including capital improvement projects.

H. Consistent with Campus Policies, each Bidder/Proposer by submitting a response, represents Respondent can provide acceptable documentation of firm's employee screening practices and background check procedures for firm's employees and subcontractors' employees.

1.03 CERTIFICATIONS FOR CONTRACTING WITH THE STATE OF ARKANSAS

CONTRACT AND GRANT DISCLOSURE

2.01 CONSISTENT WITH GOVERNOR'S EXECUTIVE ORDER 98-04, ACT 34 OF 1999 AND ACT 2262 OF 2005, THE OWNER HEREBY NOTIFIES THE CONTRACTOR OF THEIR REQUIREMENT TO DISCLOSE WHETHER ANY (1) MEMBER OF THE ARKANSAS GENERAL ASSEMBLY, (2) CONSTITUTIONAL OFFICER, (3) BOARD OR COMMISSION MEMBER, (4) STATE EMPLOYEE, (5) THE IMMEDIATE FAMILY MEMBER*, INCLUDING THE SPOUSE, OF ANY OF (1) - (4), OR (6) ANY ENTITY IN WHICH ANY PERSON DESIGNATED IN (1) - (5): (I) HOLDS ANY POSITION OF CONTROL, OR (II) HOLDS ANY OWNERSHIP INTEREST OF 10% OR GREATER BY SUBMITTING A COMPLETED AND SIGNED CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM WITH THIS CONTRACT.

2.02 BEFORE ENTERING ANY AGREEMENT WITH ANY SUBCONTRACTOR, AS DEFINED IN THIS RULE, FOR WHICH THE TOTAL CONSIDERATION IS GREATER THAN $25,000, THE CONTRACTOR SHALL REQUIRE THE SUBCONTRACTOR TO COMPLETE A CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM. NO LATER THAN 10 (TEN) DAYS AFTER ENTERING INTO ANY AGREEMENT WITH A SUBCONTRACTOR FOR WHICH DISCLOSURE IS REQUIRED, THE CONTRACTOR SHALL TRANSMIT TO THE OWNER A COPY OF THE CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM COMPLETED AND SIGNED BY THE SUBCONTRACTOR AND A STATEMENT CONTAINING THE DOLLAR AMOUNT OF THE SUBCONTRACT.

2.03 THE CONTRACTOR SHALL ENSURE THAT ANY AGREEMENT, CURRENT OR FUTURE BETWEEN THE CONTRACTOR AND A SUBCONTRACTOR FOR WHICH THE TOTAL CONSIDERATION IS GREATER THAN $25,000.00 SHALL CONTAIN THE FOLLOWING LANGUAGE:

A. Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.

PROHIBITION ON EMPLOYMENT OF ILLEGAL IMMIGRANTS

3.01 CONSISTENT WITH A.C.A. § 19-11-105, BEFORE EXECUTING THE CONTRACT, CONTRACTOR SHALL CERTIFY IN A MANNER THAT DOES NOT VIOLATE FEDERAL LAW IN EXISTENCE ON JANUARY 1, 2007, THAT THE CONTRACTOR AT THE TIME OF THE CERTIFICATION DOES NOT EMPLOY OR CONTRACT WITH AN ILLEGAL IMMIGRANT.

3.02 CONTRACTOR SHALL REQUIRE ALL SUBCONTRACTORS TO PROVIDE CERTIFICATION THAT THE SUBCONTRACTOR DOES NOT EMPLOY OR CONTRACT WITH AN ILLEGAL IMMIGRANT WITHIN 30 DAYS OF THE EXECUTION OF THE SUBCONTRACT. THE CONTRACTOR SHALL MAINTAIN ON FILE THE CERTIFICATION OF THE SUBCONTRACTOR THROUGHOUT THE TERM OF THE CONTRACT.

ISRAEL BOYCOTT RESTRICTION

4.01 CONSISTENT WITH A.C.A. § 25-1-503, THE CONTRACTOR SHALL CERTIFY, THAT THE RESPONDENT'S FIRM IS NOT CURRENTLY ENGAGED IN, AND AGREES FOR THE DURATION OF THE CONTRACT NOT TO ENGAGE IN, A BOYCOTT OF ISRAEL.

ENERGY, FOSSIL FUEL, FIREARMS, AND AMMUNITIONS INDUSTRIES BOYCOTT RESTRICTION

5.01 CONSISTENT WITH A.C.A. § 25-1-1102, FOR CONTRACTS VALUED AT $75,000 OR GREATER, A PUBLIC ENTITY SHALL NOT CONTRACT, UNLESS THE CONTRACT INCLUDES A WRITTEN CERTIFICATION THAT THE CONTRACTOR IS NOT CURRENTLY ENGAGED IN

AND AGREES NOT TO ENGAGE IN, A BOYCOTT OF AN ENERGY, FOSSIL FUEL, FIREARMS, OR AMMUNITION INDUSTRY FOR THE DURATION OF THE CONTRACT.

NON-SCRUTINIZED COMPANY CERTIFICATION

6.01 CONSISTENT WITH A.C.A. § 25-1-1203, A STATE AGENCY SHALL NOT CONTRACT WITH A COMPANY OWNED IN WHOLE OR WITH MAJORITY OWNERSHIP BY THE GOVERNMENT OF THE PEOPLE'S REPUBLIC OF CHINA (A "SCRUTINIZED COMPANY") AND SHALL REQUIRE A COMPANY THAT SUBMITS A BID OR PROPOSAL FOR A CONTRACT TO CERTIFY THAT IT IS NOT A SCRUTINIZED COMPANY AND DOES NOT EMPLOY A SCRUTINIZED COMPANY AS A CONTRACTOR.

END OF SECTION

SECTION 00 6000
PROJECT FORMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. SECTION 00 45 00 – REPRESENTATIONS AND CERTIFICATIONS

SELECT ONE OF THE FOLLOWING COMBINATIONS (A+B) OR (C+D):

A. The Owner-Approved version of Agreement Form AIA® Document A101™- 2017 Edition: “Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum”, which is included herein. It shall be executed by the successful Bidder and the Owner.

B. The Owner-Approved version of the AIA® Document A101™– 2017 Edition: Exhibit A “Insurance and Bonds”, which is included herein. It shall be executed by the successful Bidder and the Owner.

-OR-

A. The Owner-Approved version of Agreement Form AIA® Document A102™- 2017 Edition: “Standard Form of Agreement Between Owner and Contractor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price”, which is included herein. It shall be executed by the successful Proposer and the Owner.

B. The Owner-Approved version of the AIA® Document A101™– 2017 Edition: Exhibit A “Insurance and Bonds”, which is included herein. It shall be executed by the successful Proposer and the Owner.

IN EVERY CASE THE OWNER-APPROVED VERSION OF AIA 201-2017 WILL ALSO BE REQUIRED.

A. The Owner-approved version of the AIA Document A201 - 2017 Edition: "General Conditions of the Contract for Construction” which is included herein as part of the Contract Documents, and shall not be revised by the Design Professional or the Contractor.

B. SECTION 00 61 13 – UNIVERSITY OF ARKANSAS PERFORMANCE AND PAYMENT BOND FORM is the only approved performance and payment Bond form accepted by the University. The form shall be certified by the County Clerk’s Office in the county where the Work shall be performed.

C. The Supplementary Conditions for the Project are separately prepared, included in the Project Manual, and included in the Contract Documents. See SECTION 00 73 00 SUPPLEMENTARY CONDITIONS

4.02 ADMINISTRATIVE FORMS

A. Additional administrative forms as specified in Division 01 General Requirements.

B. Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."

C. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."

D. Change Order Form: SECTION 00 63 63 - UNIVERSITY OF ARKANSAS CHANGE ORDER FORM.

E. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."

F. Form of Change Directive: AIA Document G714, "Construction Change Directive."

4.03 PAYMENT FORMS

A. Schedule of Values Form: AIA Document G703, "Continuation Sheet."

B. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."

C. Affidavit of Release of Claims: SECTION 00 65 19.13 – UNIVERSITY OF ARKANSAS RELEASE OF CLAIMS FORM

D. Consent of Surety shall be submitted on either of the following:
   1. AIA Document G707 – Consent of Surety Company to Final Payment or submit this form along with Request for Final Payment.
   2. SECTION 00 65 19.19 UNIVERSITY OF ARKANSAS CONSENT OF SURETY FORM

END OF SECTION

SECTION 00 61 13 - PERFORMANCE AND PAYMENT BOND FORM

We _____, hereinafter referred to as Principal, and _____, hereinafter referred to as Surety, are held and firmly bound unto The Board of Trustees of the University of Arkansas, as obligee, hereinafter referred to as Owner, in the amount of $ _____, said amount to be deemed a performance Bond payable to Owner under the terms of this Performance and Payment Bond Agreement. The Principal and Surety state that the Surety is a solvent corporate surety company authorized to do business in the State of Arkansas.

Principal has by written agreement dated _____ entered into a Contract (the Contract) with the Owner for: _____

_____

_____

_____. The above referenced Contract is incorporated herein by reference.

Under this Performance and Payment Bond Agreement, the Principal and Surety shall be responsible for the following:

a. The Principal shall faithfully perform the above reference Contract, which is incorporated herein by reference and shall pay all indebtedness for labor and materials furnished or performed under the Contract.

b. In the event that the Principal fails to perform the Contract, the Principal and the Surety, jointly and severally, shall indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of Principal's failure to perform the Contract. Said indemnification shall include, but not be limited to, full reimbursement and repayment to the Owner for all outlays and expenses which the Owner may incur in making good any such default or failure to perform the Contract by the Principal.

c. Principal shall pay all persons all indebtedness for labor or material furnished or performed under the Contract and in doing so this obligation shall be null and void. In the event that Principal fails to pay for such indebtedness, such persons shall have a direct right of action against the Principal and Surety, jointly and severally, under this obligation, subject to the Owner's priority.

d. Principal shall guarantee the faithful performance of the prevailing hourly wage clause as provided in the Contract.

This Bond given in accordance with Arkansas laws and regulations (including Ark. Code Ann. § 18-44-503, § 19-4-1405 and § 22-9-401 et seq.). The Surety guarantees that the Principal shall comply with Ark. Code Ann. § 22-9-308 (d) by payment and full compliance with all prevailing hourly wage contract provisions where the contract amount exceeds the amount provided in Ark. Code Ann. § 22-9-302(1).

Any alteration which may be made in the terms of the Contract, or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the contract, or any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal and the Surety or Sureties or either or any of them, their heirs, personal representatives, successors or assigns from their liability hereunder, notice to the Surety or Sureties of any such alteration, extension or forbearance being hereby waived. In no event shall the aggregate liability of the Surety exceed the amount provided in the Contract.

This Performance and Payment Bond Agreement is binding upon the above-named parties, and their successors, heirs, assigns and personal representatives.

Executed by the parties who individually represent that each has the authority to enter into this agreement.

BY: _____

Contractor Date

BY: _____

Agent/Attorney-in-Fact Date

(In accordance with Ark. Code Ann. § 22-9-402(b))

_____

Agent Date

_____

Address

_____

City County State Zip Code

Business Phone: _____

Fax: _____

Email: _____

THIS IS THE ONLY PERFORMANCE AND PAYMENT BOND FORM ACCEPTABLE TO THE OWNER

END OF DOCUMENT

UNIVERSITY OF ARKANSAS
CHANGE ORDER

PROJECT:	Project Name	CHANGE ORDER #	0
CONTRACTOR:	Name	CONTRACT #	0

"I, THE UNDERSIGNED CONTRACTOR, DO HEREBY CERTIFY THAT I HAVE REVIEWED MY FILES AND DECLARE THAT ☐ THERE ARE ☑ THERE ARE NOT NEW OR ADDITIONAL SUBCONTRACTORS AND SUB-SUBCONTRACTORS WHICH ARE REQUIRED TO BE DISCLOSED UNDER THIS CONTRACT PURSUANT TO THE GOVERNOR'S EXECUTIVE ORDER 98-04. I HAVE ATTACHED TO THIS CHANGE ORDER THOSE DISCLOSURES REQUIRED UNDER THE ORDER. I UNDERSTAND THAT ANY FALSE INFORMATION PROVIDED BY OR OMISSION MADE BY ME, MAY BE GROUNDS FOR TERMINATION DUE TO MATERIAL BREACH."

The undersigned entities agree that the following changes shall be incorporated into the contract:
(Attach additional sheets if required)

The original contract sum was:	$	0.00
The net change by previous Change Order(s) was:	$	0.00
The contract sum prior to this Change Order is:	$	0.00
The contract sum will increase (decrease) by this Change Order:	$	0.00
The new contract sum including this Change Order shall be:	$	0
The contract time will be increased (decreased) by:	0	Days
The date of the contract completion is now:	3/27/23	

DESIGN PROFESSIONAL

Firm Name
Address Line
City, State, Zip Code

CONTRACTOR

Firm Name
Address Line
City, State, Zip Code

OWNER:
THE BOARD OF TRUSTEES OF THE UNIVERSITY OF ARKANSAS
ACTING FOR AND ON BEHALF OF THE UNIVERSITY OF ARKANSAS, FAYETTEVILLE

BY:

Daniel Clairmont, Director Engineering & Construction

Ann Bordelon, Executive Vice Chancellor Finance and Administration

SECTION 00 65 19.13 – RELEASE OF CLAIMS FORM

Comes the undersigned, who does hereby swear and affirm that:

1) My name is _____, (print or type)
and my address is _____,
doing business as _____.

2) Pursuant to Contract Number _____, _____ (project description)
and Contract Date _____ excepted as listed below in Paragraph 4, I have paid or otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known claims against the Contractor arising in any manner in connection with the performance of the contract referenced above for which the Owner or his property might in any way be held responsible.

3) To the best of my knowledge, information and belief, excepted as listed below in Paragraph 4, the Releases or Waivers of Claim, attached hereto and incorporated herein, include the Contract, all subcontractors, all suppliers of materials and equipment, and all performers of work, labor or services who have or may have claims against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

4) The Exceptions are: (if none, indicate "none." If required by the Owner, the Contractor shall furnish Bond satisfactory to the Owner for each exception.)_____

_____

_____ _____

AFFIANT DATE

VERIFICATION

STATE OF ARKANSAS)
)
COUNTY OF _____)

SUBSCRIBED AND SWORN TO before me this _____ of _____, 20____.

_____

NOTARY PUBLIC

MY COMMISSION EXPIRES

SECTION 00 65 19.19 – CONSENT OF SURETY FORM

Contractor may submit either the AIA Document G707 – Consent of Surety Company to Final Payment or submit this form along with Request for Final Payment.

Comes the undersigned, who does hereby swear and affirm that:

1) My name is _____ and I am an authorized representative of _____ , a surety company.
2) With regards to the Project _____; Project # _____; Contract date _____; _____ Contractor; and the Board of Trustees of the University of Arkansas acting for and on behalf of the University of Arkansas, Fayetteville as the Owner; I hereby approve the final payment to the Contractor. I agree that the final payment to the Contractor shall not relieve the Surety Company of any of its obligations as set forth in the contract with the State of Arkansas and this Contractor.

_____ _____

AFFIANT DATE

VERIFICATION

STATE OF ARKANSAS)
)
COUNTY OF _____)

SUBSCRIBED AND SWORN TO before me this _____of _____, 20____.

_____

NOTARY PUBLIC

MY COMMISSION EXPIRES:

SECTION 00 7213
GENERAL CONDITIONS

PART 1 - GENERAL

1.01 AUTHORITY

A. General Conditions and Supplementary Conditions are an integral part of all sections of Project Manual. Their contents and provisions shall be carefully noted in performance of Work.

1.02 STANDARD DOCUMENT

A. "General Conditions of the Contract for Construction", Document No. A201 of American Institute of Architects, 2017 Edition, inclusive of Owner provisions, is hereby bound and incorporated into these specifications and is to be used as the General Conditions for this contract.

B. Participation in the Work of this Project is considered acknowledgement of the participants understanding of, and agreement with, all requirements of the Contract for Construction. Maintain one (1) printed edition of the General Conditions at the Project Site during construction.

1.03 AMENDED PROVISIONS

A. Where any article or articles of above AIA General Conditions are supplemented by Supplementary Conditions, provisions of such articles shall remain in effect and supplementary provisions shall be considered as added thereto. Where any such article or part of such article is amended, voided or changed by Supplementary Conditions, provisions not specifically so amended, voided or changed shall remain in full effect. Where provisions of Supplementary Conditions are at variance or conflict with provisions of the AIA General Conditions, Supplementary Conditions shall govern. AIA General Conditions and Supplementary Conditions apply to all Work in every Division or Section of these Specifications.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

ARCHITECT SHALL RESERVE USE OF SUPPLEMENTARY CONDITIONS FOR PROJECT SPECIFIC REVISIONS/ADDITIONS TO THE CONTRACT DOCUMENTS AND ONLY IN REVIEW WITH THE DIRECTOR OF ENGINEERING AND CONSTRUCTION.

1.01 REFERENCE STANDARDS

A. AIA A201 - General Conditions of the Contract for Construction; 2007.

ALWAYS REVIEW SUPPLEMENTARY CONDITIONS IN CONJUNCTION WITH THE GENERAL CONDITIONS, BECAUSE THEY COULD SUBSTANTIALLY MODIFY THE GENERAL CONDITIONS; SUCH A MODIFICATION WOULDN'T BE APPARENT ON THE FACE OF THE GENERAL CONDITIONS. WHILE CREATING A SEPARATE SET OF SUPPLEMENTARY CONDITIONS IS FINE AS A MATTER OF CONTRACT LAW, IT'S NOT A BEST PRACTICE. THE AIA, FOR INSTANCE, ASSUMES PARTIES WILL TAKE ADVANTAGE OF THE ELECTRONIC VERSIONS OF THEIR DOCUMENTS AND TYPE CHANGES DIRECTLY INTO THE AIA A201-2017 INSTEAD OF CREATING A NEW DOCUMENT

PART 1 - GENERAL

3.01 REFERENCE DOCUMENT

A. The following supplements modify AIA Document A201 - 2017 Edition General Conditions of the Contract for Construction. Where a portion of the General Conditions is modified or deleted by these Supplementary Condition, the unaltered portions of the General Conditions shall remain in effect.

EXAMPLE OF A PROJECT SPECIFIC CONDITION:

A. GENERAL: Substitute “Engineer” for all references to “Architect.”

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL V.22

1.01 PROJECT

A. Project Name: UA Alpha Phi House

B. Owner's Name: Alpha Phi Intentional Fraternity.

C. The Project consists of the construction of an approximately 34,800 gross square foot (inside f.o. wall) freestanding 4 story, steel and wood framed structure with a partial basement designed for a sorority on a college campus including residential occupancy.

1.02 WORK BY OWNER

A. The Owner, without sacrificing their right to do so, does not plan to undertake significant work with their own forces within the construction site prior to Substantial Completion. Refer to the responsibility maxtrix following this section for components being performed by Owner.

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:

C. Owner will supply and install the following:
   1. Reference drawings.

D. Owner will supply the following for installation by Contractor:
   1. Decorative Lighting as scheduled

E. Items and equipment noted to be Contactor Furnished and Contractor Installed is to be purchased new by the Contractor and all cost associated with the handling, installation and connection should be included turn-key in the project. All items and equipment noted to be Contractor Installed shall be coordinated with provider and the Contractor shall include all costs for handling, installation and connection in the project.

F. Cooperate fully with the Owner's own forces or separate contractors, if any, so work on those contracts may be carried out smoothly, without interfeering with or delaying work under this contract.

1.03 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

C. Do not unreasonably encumber site with materials or equipment. Confine stockpiling of materials to areas authorized by Owner.

D. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

E. Workers on the jobsite are to be reminded that adjunct areas are occupied and in use on the campus. **Workers will maintain a respectful attitude toward all people for the duration of**

the construction project. Abusive language or gestures will result in immediate dismissal from the project.

F. Existing building spaces may not be used for storage.

G. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to the hours of 7:00 am through 4:00 pm.

H. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1400
WORK RESTRICTIONS

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.02 SUMMARY

A. Section includes requirements for communication with the University of Arkansas (UA), including after-hours, and emergencies.

B. Section includes requirements for Work Plan approval and coordination with the Owner's Representative.

C. Section includes Use of the Site, Construction Parking, and Temporary Controls.

1.03 RELATED DOCUMENTS:

A. AIA Document A201 - 2017 Edition: "General Conditions of the Contract for Construction"

B. SECTION 01 41 00 – REGULATORY REQUIREMENTS

1.04 SUBMITTALS

A. Shop Drawing: Prior to site mobilization, Contractor shall prepare and submit for review and approval by Owner's Representative a mobilization/staging plan indicating:
   1. Vehicle routing, construction entrance points, unloading zones, on-site parking, and lay-down areas
   2. Pedestrian safety plan if detours are required, show detour and signage locations for wayfinding.
   3. Temporary utilities
   4. Temporary Controls; including barriers, enclosures and fencing, dust and mud control, protection of the Work, landscape/hardscape protection, and stormwater pollution prevention measures;
      a. Identify BMPs required and inlets that will need protection. If the site is less than one acre, a formal NPDES Small Site Permit is not required, but stormwater management is always required. Review implemented BMPs prior to soil disturbance.
   5. Construction Facilities; offices, sheds, portable toilets, trash and recycle haulers etc.
   6. Construction aids including the foundations and swing zones for cranes.

B. Contractor shall submit a detailed traffic management plan(s) to the Owner's Representative for review and approval. Traffic plan shall clearly indicate vehicle, bicycle, and pedestrian paths.

C. Contractor shall provide Owner's Representative specific work plans for each Contract activity and obtain approval before beginning the Contract activity; provide schedule information in the work plans including workdays and work times.

1.05 COMMUNICATION

A. Except for emergencies, Contractor shall only communicate through the Owner's Representative; Facilities Management's Construction Coordinator. Do not communicate directly with building occupants, public, or other Campus stakeholders.
   1. Contractor shall notify the designated Construction Coordinator of all communications and complaints received from occupants and the public.
   2. Written correspondence by email shall include the project name in the subject line of the email. Communications shall be limited to one project per communication.

B. For emergencies, communicate directly with occupants and the public to avoid and minimize injury and damage.

C. In the event of an after-hours emergency or if you witness a leak, power outage, etc. not related to your construction project, please report the problem by calling 479-575-5050 (between 7:30-

5:00 M-F) or 479-575-2222 (after hours). On-call Facilities Management employees will attend to the issue.

D. In an emergency involving the High-Pressure Natural Gas Transmission Pipeline, first call for Emergency Response at 911, then contact Central Utilities at 479-575-5300 or 479-575-2222 (after hours).

PART 2 - WORK PLAN APPROVAL

2.01 COORDINATION WITH FACILITIES MANAGEMENT

A. Contractor shall work in direct coordination with the Owner's Representative; Facilities Management's Construction Coordinator to accomplish the following:
   1. Co-host the Pre-Bid Meetings with subcontractors; coordinate time, location, and agenda with the designated Construction Coordinator.
   2. Co-host the Pre-Construction Meeting; coordinate time, location, and agenda with the designated Construction Coordinator.
   3. Avoid or otherwise minimize the impact of contract activities within occupied areas and minimize disturbance to campus and neighbors.
   4. Plan for site access, construction parking, and lay-down areas.
   5. Sequence arrival of trucks and deliveries to avoid conflicts with class changes.
   6. Schedule street and lane closures, excavations, utility disruptions, etc.

B. Prior to start of construction obtain a calendar from the Owner's Representative indicating major campus events, study and examination periods, holidays, and quarter breaks. The Contractor may be asked to restrict deliveries or suspend Work during such events or as requested by the Owner.

C. Facilities Management reserves the right to review submittals and shop drawings for compliance with UA Standards. When Facilities Management staff takes exception with the submittal or shop drawing, the Architect/Engineer and Contractor shall work to obtain revised submittals to UA satisfaction.

2.02 ADVANCED NOTICE

A. Contractor shall develop work plans to minimize disturbance, disruption, and nuisance for the campus community and the neighboring properties.
   1. Service interruptions shall be coordinated with Owner Representative and identified in the project work plan/schedule.
   2. Provide written request to work within occupied areas at least seven (7) calendar days in advance.
   3. Provide at least fourteen (14) days' advanced notice before any required road/lane closure.

B. Contractor shall be responsible for locating all existing utilities before Work begins. Thoroughly investigate existing conditions and check for concealed utilities prior to cutting, drilling, demolition, and other activities which could damage utilities. In addition to contacting Arkansas One Call 811, Contractor shall contact University Central Utilities (479) 575-5300 prior to excavations.
   1. Provide at least seven (7) calendar days' advanced notice of excavations in proximity to the campus high-pressure gas transmission line.
   2. Provide at least two (2) days' advanced notice before other excavations.

C. See also _USE_OF_PARKING

2.03 NOISE & VIBRATION RESTRICTIONS

A. Contractor shall limit the time and duration of potentially disruptive construction operations involving noise, vibration, odors, or any other activities that MAY be considered as objectionable by adjacent residential neighbors and comply with rules and regulations of the AHJ as applicable.

B. Working hours for projects located adjacent to residential areas or campus housing may be restricted; coordinate hours of work with the Owner's Representative.

C. Minimize noise/vibration from construction activities and when possible, limit disruptive construction activities to times when classes are not in session.
   1. The use of explosives must receive prior approval from Facilities Management.
   2. The use of explosive pins for vertical suspension of any items on the project must receive prior approval from Facilities Management.
   3. Do not play radios, tape recorders, televisions, and related items at the construction site.

2.04 UTILITY SERVICE INTERRUPTIONS

A. See ADVANCED NOTICE

B. The Contractor shall coordinate all Work so there shall be no prolonged interruption of existing utilities, systems, and equipment of Owner. Any existing plumbing, heating, ventilating, air conditioning, or electrical disconnection necessary, which affect portions of this construction or building or any other building, must be scheduled with the Owner's Representative to avoid any disruption of operation.

C. Any interruption of utilities, either intentionally or accidentally, shall not relieve the Contractor from repairing and restoring the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job. In no case shall utilities be left disconnected at the end of a workday or over a weekend.

D. Accidental Damage and Service Interruptions: Notify the Owner and Architect immediately. Take effective action to minimize damage and disruption to occupied areas. Provide equivalent temporary utilities. Restore permanent utilities as quickly as possible. No additional payments will be made related to unintentional service interruptions.

PART 3 - USE OF THE SITE

3.01 SITE ACCESS AND MAINTENANCE

A. The Contractor and its subcontractors shall allow the Owner, Architect and Owner's other consultants access to the Work.

B. Contractor shall ensure that the Work is at all times performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas.

C. Contractor shall provide unimpeded access for emergency vehicles.
   1. Contractor shall maintain 20-foot 6.56 yard width driveways with turning space between and around combustible materials.
   2. Contractor shall provide and maintain access to fire hydrants.

D. Contractor shall comply with AHJ representatives regarding regulations and/or restrictions on use of public streets.

E. Contractor shall maintain traffic and parking areas in a sound condition.
   1. Contractor shall ensure that tracked vehicles do not operate on paved areas.
   2. Contractor shall repair breaks, potholes, low areas, standing water and other deficiencies, to maintain paving and drainage in original or specified condition.
   3. Contractor shall provide protection under all temporary dumpsters and materials placed on paved surfaces.

F. Contractor shall keep public and private rights-of-way and parking areas clear of construction-caused soiling, dust, and debris, especially debris hazardous to vehicle tires. Contractor shall perform cleaning as frequently as necessary.

G. Contractor shall comply with all on-campus traffic regulations, including speed limits. Contractor shall pay all parking and traffic fines. Such fines are not reimbursed by the project.

3.02 CONSTRUCTION PARKING

A. Contractor shall provide parking for construction purposes. All parking of workers' automobiles on campus will be confined to defined areas as coordinated with UA Transit and Parking Department. Contact the Maintenance Manager at the UA Transit and Parking Department at (479) 575-2739 if you have questions about construction parking on campus.

B. Contractor shall not park on public roadways unless approved by the AHJ.

C. Contractor shall obtain and pay for parking permits for on-campus parking, including use permits for campus parking lots and for parking on the construction site itself.
   1. If space is available, a maximum of ten (10) temporary parking spaces outside the construction site may be assigned to the general contractor who will authorize vehicles to utilize them. Charges for these spaces will be based on a monthly fee equal to one-twelfth the annual 24-hour reserved rate. Contractor shall sign the spaces as “Reserved Construction Only.”
   2. Employees of the general contractor and the subcontractors not receiving one of the Reserved spaces must obtain a Construction Permit (for a monthly fee) to be authorized to park in designated yellow faculty/staff lots, or an Economy permit and park in the Economy lot.

D. Parking tickets are not a valid cost of the Work. The Owner will not reimburse the Contractor for parking or moving violations.

3.03 USE OF PARKING AREAS FOR CONSTRUCTION ACTIVITIES

A. Requests for the temporary vacation and permanent closure of parking spaces for construction purposes must be made in advance and shown on the mobilization plan. This space should be an appropriate size for material, equipment, and dumpsters, and not include vehicle parking.

B. Temporary Vacating: In cases where parking spaces are scheduled to be temporarily vacated due to construction activities advanced notice is required to allow parking permit holders to be notified and relocated.
   1. Reserved Spaces: 10 business days’ notice.
   2. Non-Reserved: 5 business days’ notice.
   3. The cost of the spaces closed due to the temporary closure will be at the current parking rate according to the permit type and type of closure.
   4. Exceptions:
      a. Temporary vacation of parking facilities made for the purpose of maintaining those parking facilities; power washing, resurfacing, restriping etc. shall be underwritten by Transit and Parking.
      b. Temporary vacating of lots when the University is closed, where vehicle parking is not impacted by construction activities.

C. Emergency Vacating: UA Transit and Parking will contact permit holders to move their vehicles. The Contractor will be required to pay the relocation fee for all vehicles whose owners cannot be contacted. Charges will be based on the tow/relocation rate and may be submitted as a Cost of the Work.

D. UA Transit and Parking will bag or remove meters that are vacated for construction use. The Contractor is responsible for providing all signage declaring the closure(s).

3.04 USE OF THE PROJECT AREA

A. The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.
   1. Only materials and equipment used directly in the Work shall be brought to and stored on the site. After equipment is no longer required for the Work, it shall be promptly removed.
   2. Schedule deliveries to minimize requirements for storage of materials. Confine stockpiling of materials and location of storage sheds, if any, to areas approved for such use.

3. Contractor shall move any stored products which interfere with operations of University or contractors performing work under separate contracts for University.
4. Contractor shall coordinate with the Owner's Representative if additional off-site space is needed.

B. Without limitation of any other provisions of the Contract Documents, Contractor shall not interfere with the occupancy or beneficial use of (1) any areas and buildings adjacent to the Work or (2) the Work in the event of partial occupancy.

C. No signs, banners, or flags shall be erected without the written approval of the Owner's Representative.

D. Contractor shall keep site clear of trash and debris and in neat order. Contractor shall be responsible for cleanliness and order of the site and assigned off-site staging areas, as acceptable to the Owner's Representative.

E. Contractor shall comply with all requests from the Owner's Representative to immediately remedy site conditions perceived as unsafe, unsanitary, illegal, or otherwise out of compliance with UA Standards.

F. The Owner reserves the right to install fixtures, furnishings, equipment, signage, and communication systems, including phone, data networks, security, or control systems within completed areas of the Work before Substantial Completion, provided it does not interfere with completion of the Work. This use will not constitute acceptance or partial acceptance of the Work.

3.05 TEMPORARY CONTROLS & UTILITIES

A. Contractor shall install all required temporary controls and assume full responsibility for protection of the site and safekeeping of the Work and products stored in the Project Area.
1. Temporary controls shall include protection of Senior Walk, Campus Landscape and Hardscape.
2. Temporary controls shall include trench protection in compliance with Ark. Code Ann. § 22-9-212.
3. Temporary controls shall include Stormwater Pollution protection.
4. Temporary controls shall include protective railings in compliance with 29 CFR 1926 Subpart M – Fall Protection.
5. Temporary Sanitary Facilities shall be provided by the Contractor. Toilet facilities in existing buildings shall not be used by construction personnel.

B. Contractor may be authorized to receive and use building keys to complete Work under this Contract.
1. Coordinate key requests with the assigned Owner's Representative.
2. Contractor shall without limitation follow UA Policy 409.3 Keys for University Buildings, Rooms, Gates, and Bollards
3. Contractor shall without limitation follow the Standard Operating Procedures enforced by the Key Office (Contractor Key Accountability).

C. For any non-restricted space/room(s) vacated entirely for construction or renovation, the key lock cylinders shall be removed by the University, and it shall be the contractor's responsibility to provide appropriate security for the space/room(s). If the contractor chooses to install temporary key cylinders, they must be compatible with the existing or new door lock. See Section 08 00 00 – OPENINGS

D. Removal of Construction Facilities and Temporary Controls: Unless otherwise mutually agreed by Owner's Representative and Contractor, Contractor shall remove temporary materials, equipment, services, and construction prior to Substantial Completion review.

E. Removal of Temporary Utilities and Restoration: Contractor shall remove temporary underground utility installations to a depth of two feet. Backfill, compact, and regrade site as necessary to restore areas or to prepare for indicated paving and landscaping.

3.06 WORK IN RIGHTS-OF-WAY

A. Temporary closures or restricted use of public thoroughfares, as necessary to accomplish the Work, shall be made only as approved in advance and as directed in writing by the Owner's Representative.

B. Contractor shall provide and locate temporary signs and signals as required by the AHJ or Owner's Representative.

C. Contractor shall employ a minimum of two (2) trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on vehicular and pedestrian traffic lanes.

D. Oversized loads shall be coordinated with Owner's Representative and have a public safety escort.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G-702 Application and Certificate for Payment.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

I. Submit one electronic and three hard-copies of each Application for Payment.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 15 days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.

F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Cash allowances.

B. Payment and modification procedures relating to allowances.

1.02 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts.

B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; product mark-up; cost of installation materials; and labor for installation and finishing. All the aforementioned costs shall be included in the base bid for the project, unless noted otherwise in the Allowances Schedule below..

C. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

D. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers , and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Differences in costs will be adjusted by Change Order.

1.03 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 INSPECTING AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.

B. Costs Not Included in the Inspecting and Testing Allowances:
   1. Costs of incidental labor and facilities required to assist inspecting or testing agency.
   2. Costs of testing services used by Contractor separate from Contract Document requirements.
   3. Costs of retesting upon failure of previous tests as determined by Architect.

C. Payment Procedures:
   1. Submit one copy of the inspecting or testing firm's invoice with next application for payment.
   2. Pay invoice on approval by Architect.

D. Differences in cost will be adjusted by Change Order.

1.05 ALLOWANCES SCHEDULE

A. Section _____-_____: Include the stipulated sum of $_____ for purchase and delivery of _____.

B. Section _____-_____: Include the stipulated sum of $_____ for purchase and delivery of _____.

C. Section _____-_____: Include the stipulated sum of $_____ for purchase and delivery of _____.

D. Section _____-_____: Include the stipulated sum of $_____ for purchase and delivery of _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

A. Document 00 2100 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

G. Measurement by Area: Measured by square dimension using mean length and width or radius.

H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

K. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.
   7. Products placed and concealed prior to assessment of quantity or volume.

1.07 ASSESSMENT

A. Replace Work, or portions of the Work, not complying with specified requirements.

B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
   2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

A. Item: _____; Section _____.

B. Item: _____; Section _____.

C. Item: _____; Section _____.

D. Item: _____; Section _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.02 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Remove finishes at Lower Level

1. Description: Provide pricing to remove LVT flooring (LVT-1) and painted finish on walls and ceiling at Lower Level. Drywall to remain unfinished.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL V.22

1.01 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.02 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. Within 10 days after joint review, submit complete schedule.

1.03 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.04 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 22 x 17 inches. Provide electronic file(s) in PDF format.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Provide sub-schedules to define critical portions of the entire schedule.

D. Include conferences and meetings in schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

G. Indicate delivery dates for owner-furnished products.

H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities. Revised schedules should show original baseline start and finish dates for activities in comparrison with actual work started and completed.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. ICC (IFC) - International Fire Code; 2012.

G. ICC (IFGC) - International Fuel Gas Code; 2012.

H. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. ICC (IPC) - International Plumbing Code; 2012.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

K. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings; 1990 (R1997).

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 SUMMARY

A. Section includes:
   1. Certain Codes, Standards, and relevant requirements applicable to the Work required under this Contract.
   2. Jurisdictional and contact information for utility service and supply inspections.

1.03 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

B. SECTION 01 14 11 WORK RESTRICTIONS

C. SECTION 01 78 23 OPERATIONS AND MAINTENANCE DATA INTEGRATION.

D. Submit to the University Representative copies of all permits, licenses, certifications, inspection reports, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records and other documentation established and/or required in conjunction with compliance with specified standards and regulations. Maintain copies of the aforementioned documents at the project site at all times.

1.04 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS

A. Authority: All codes, ordinances and standards referenced in the Drawings and Specifications shall have the full force and effect as though printed in their entirety in the Specifications.

B. Precedence:
   1. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.
   2. Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and

standards, the Drawings and Specifications shall take precedence so long as such increase is legal.

3. Where no requirements are identified in the Drawings or Specifications, comply with all requirements of applicable codes, ordinances and standards of authorities having jurisdiction.

1.05 STATUTORY AND JURISDICTIONAL REGULATIONS

A. Perform the Work in accordance with Applicable Code Requirements and applicable requirements of all other regulatory agencies.

B. Unless otherwise specified, specific references to codes, regulations, standards, manufacturers' instructions, or requirements of regulatory agencies, when used to specify requirements for materials or design elements, shall mean the edition of each in effect as identified in the Contract Documents.

C. Contractor shall maintain copies of regulatory reference manuals and code books on the job site for reference during planning, submittal processing and field installation of specific work.

D. Contractor and each subcontractor or supplier engaged in construction of the project shall be thoroughly familiar with the codes and regulations applicable to their specific construction activities. Contractor's responsibility for familiarity with applicable codes and regulations shall extend to the entire scope of work specified in the Contract Documents.

E. Regulatory requirements applicable to this project shall include the following:

1. Consistent with Ark. Code Ann. § 22-9-212 where any public improvement construction project involves any trench or excavation which equals or exceeds five feet (5′) in depth, the current edition of the United States Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 C.F.R. Part 1926, Subpart P, be specifically incorporated into the specifications for the project.
2. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
3. The rules adopted by the Arkansas Pollution Control and Ecology Commission (APC&EC) serving as the basis for DEQ's permitting, monitoring and enforcement programs, public involvement activities and other services.
    a. Emission Producing Equipment
        1) Jeff Siebler, FAMA Energy Conservation Engineer; jsieble@uark.edu
    b. Asbestos Abatement
        1) FAMA Environmental Health and Safety (575-6175) works directly with the State Asbestos Program to obtain State permits.
        2) The Contractor shall submit the Asbestos Notice of Intent 10 days before any renovation or demolition to the assigned FAMA Construction Coordinator.
4. The University of Arkansas operates a National Pollutant Discharge Elimination System (NPDES) permit in compliance with the Arkansas Department of Energy and Environment's Division of Environmental Quality (ADEQ).
5. Contractors are expected to adhere to the University's Illicit Discharge Policy.
6. The University is its own MS4 and issues NPDES Small Site permits for projects between 1 and 5 acres under the University of Arkansas MS4 Permit from ADEQ.
7. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition
8. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
9. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
10. Arkansas Building and Fire Code
    a. ICC (IFC)- International Fire Code; 2021 Including All Applicable Amendments and Supplements
    b. ICC (IBC)- International Building Code; 2021 Including All Applicable Amendments and Supplements
    c. Contact/AHJ: Campus Fire Marshall; University of Arkansas (479)575-5448

11. Arkansas Electric Code
    a. NFPA 70 - National Electrical Code; 2023 Including All Applicable Amendments and Supplements.
12. Arkansas Plumbing and Fuel Gas Code
    a. ICC (IPC)- International Plumbing Code; 2018 Including All Applicable Amendments and Supplements.
    b. ICC (IFGC)- International Fuel Gas Code; 2018 Including All Applicable Amendments and Supplements.
    c. Contact/AHJ: Arkansas Department of Health 4815 West Markham Street, Slot 24 Little Rock, Arkansas 72205-3867, (501)661-2647 or (800)462-0599
        1) State Plumbing Inspector:
        2) Marty Harris; william.harris@arkansas.gov, (479)444-7700
13. Arkansas Mechanical Code
    a. ICC (IMC)- International Mechanical Code; 2021 Including All Applicable Amendments and Supplements.
    b. Contact/AHJ: Arkansas Department of Labor 900 W. Capitol Avenue Suite 400 Little Rock, Arkansas 72201, (501)682-9201
14. Arkansas Energy Code
    a. ICC (IECC)- International Energy Conservation Code; 2009 Including All Applicable Amendments and Supplements.
    b. ASHRAE 90.1-2007
    c. Contact/AHJ: Arkansas Dept. of Environmental Quality Arkansas Energy Office, 5301 Northshore Drive North Little Rock, AR 72118-5317, (501)682-1121 Fax: (501)682-2433
15. Elevators and Escalators
    a. ASME a17.1-2007 Safety Code for Elevators and Escalators
    b. Contact/AHJ: Arkansas Department of Labor 900 W. Capitol Avenue Suite 400 Little Rock, Arkansas 72201, (501)682-9201
16. Telecommunications

A. NFPA 70 – NATIONAL ELECTRICAL CODE, CURRENT VERSION ADOPTED BY LOCAL OR STATE AHJ.
B. ANSI/TIA/EIA - 607: COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS.
C. TIA-310- D CABINETS, RACK, AND ASSOCIATED EQUIPMENT
D. ANSI/TIA/EIA - 568 B: COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD.
E. ANSI/TIA/EIA - 569: COMMERCIAL BUILDING STANDARD FOR TELECOMMUNICATION PATHWAYS AND SPACES.
F. ANSI/TIA/EIA - 606: THE ADMINISTRATION STANDARD FOR THE TELECOMMUNICATIONS INFRASTRUCTURE OF COMMERCIAL BUILDINGS.
G. ANSI/TIA/EIA - 606A: ADMINISTRATION STANDARD FOR COMMERCIAL TELECOMMUNICATIONS INFRASTRUCTURE.
H. IEEE 241 - IEEE RECOMMENDED PRACTICE FOR ELECTRIC POWER SYSTEMS IN COMMERCIAL BUILDINGS" PERTAINING TO COMMUNICATION SYSTEMS.
I. ISO/IEC IS 11801: GENERIC CABLING FOR CUSTOMER PREMISES
J. J-STD-607-A – COMMERCIAL BUILDING GROUNDING (EARTHING) AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS, CURRENT VERSION.
K. TIA/EIA - TSB67: TRANSMISSION PERFORMANCE SPECIFICATIONS FOR FIELD TESTING OF UNSHIELDED TWISTED PAIR CABLING SYSTEMS.

1.01 UNIVERSITY OF ARKANSAS – ENVIRONMENTAL HEALTH AND SAFETY

A. Comply with University of Arkansas Environmental Health and Safety publications and requirements including, without limitation:
   1. Manuals, Guides, Policies, Checklists
      a. https://enhs.uark.edu/manuals.php
   2. Compressed Gas Cylinder Procedures
      https://enhs.uark.edu/_resources/documents/compressed-gas-cylinder-procedures.pdf
   3. Lockout / Tagout
      a. https://enhs.uark.edu/_resources/documents/lockout-tagout-procedure.pdf
   4. Facilities Management Hot Work Permit Policy
      https://enhs.uark.edu/_resources/documents/hot-work-permit-policy.pdf
   5. Standard Operating Procedure for Hot Works Operations
      https://enhs.uark.edu/_resources/documents/hot-work-sop.pdf
   6. Accident Reporting
      a. https://forms.uark.edu/xfp/form/391

1.02 UTILITY SERVICE AND SUPPLY, INSPECTIONS THEREOF

1. Engineer of Record shall provide periodic construction observations and correction reports for all Work on the supply side of the service point of delivery.
2. Contractor shall request inspections from the Engineer of Record and the AHJ before covering Work.
3. Water and Sewer Service (City of Fayetteville)
4. Domestic & Irrigation Service Lines to the meter, including containment backflow preventers.
5. Sanitary and storm sewer mains and manholes.
6. Fire Service Line up to and including the containment backflow preventer.
7. Water and Sewer Supply Piping (State Plumbing Inspector)
8. Domestic, Irrigation, and Fire Supply Line beyond the meter, containment and isolation backflow preventers, building’s plumbing system.
9. Sanitary and storm sewer lines within the building, and extending out to a main line.
10. Facilities Management Plumbing Shop will review all isolation valves and backflow preventers for compliance with UA Standards during submittals. Backflow preventers shall be tagged as assets; reference SECTION 01 78 23 OPERATIONS AND MAINTENANCE DATA INTEGRATION.
11. Contact FAMA Construction Manager (479)575-5470 for coordination of service connections.
12. Fireline Supply Piping (Campus Fire Marshal)
13. Fireline Supply piping beyond backflow preventer, Fire Pump, & Fire Protection System
14. Natural Gas Service (Black Hills Energy)
15. Fuel Gas Piping / Natural Gas Service Lines up to and including the meter and the regulator.
16. Black Hills representation MUST BE ON SITE when excavating within 10 feet of the Black Hills High- Pressure Gas Lines.
17. University personnel MUST BE ON SITE when excavating within 10 feet of the U of A High- Pressure Gas Transmission Line; University Central Utilities (479) 575-5300
18. Natural Gas Supply Lines (State Building Inspector)
19. Natural Gas Supply beyond the meter and within the building
20. Pressure test shall be observed by State Plumbing inspector.
21. Electrical Delivery / Service ahead of the Service Point
22. Coordinate service provider with designated FAMA Construction Coordinator
    a. On Campus: FAMA Power Distribution (479)575-6179
    b. Perimeter and off Campus: AEP Energy - SWEPCO (888)216-3523
23. Electrical Supply / Service Point and beyond.
24. Third party?

25. Fire Alarm Testing: Campus Fire Marshall; University of Arkansas (479)575-5448 inch conjunction with IDIQ Contractor and FAMA Alarm Shop
26. Steam Supply and Service (University Central Utilities)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power , consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. Provide and pay for all lighting, heating and cooling, and ventilation required for construction purposes.

C. Existing facilities may not be used.

D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Provide telephone, cellular phone, and high-speed internet connection to jobsite.

C. Provide on jobsite capacity of viewing and printing out physical copies of electronic versions of construction documents, submittals, RFIs, ASI, etc.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

B. Used material may be used for construction fence. Provide duplicate keys of any gate lock to Owner. Contractor to be responsible for maintainence of fence for duration of project.

1.07 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction as detailed by Architect.

B. Erect on site at location established by Architect.

C. Project Identification Signs:
   1. One painted sign, 64 square feet area, bottom 3 feet above ground.
   2. Content:
      a. Project title, logo and name of Owner as indicated on Contract Documents.
      b. Names and titles of authorities.
      c. Names and titles of Architect/Engineer.
      d. Name of Prime Contractor.
   3. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.

D. Sign Materials:
   1. Structure and Framing: New wood, structurally adequate.
   2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4-inch thick, standard large sizes to minimize joints.
   3. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
   4. Lettering: Exterior quality paint, contrasting colors as selected.

E. Installation:
   1. Install project identification signs within 15 days after date fixed by Notice to Proceed.
   2. Erect at location directed by the Architect.
   3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
   4. Install signs surface plumb and level, with butt joints. Anchor securely.
   5. Paint exposed surfaces of signs, supports, and framing.

F. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

G. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore the area.

H. No other signs are allowed without Owner permission except those required by law.

1.11 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL V.22

1.01 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, manufacturer warranties and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

C. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made of wood from newly cut old growth timber.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions.
   2. If wet-applied, have lower VOC content.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of recycled materials.
   7. Are Cradle-to-Cradle Certified.
   8. Have a published GreenScreen Chemical Hazard Analysis.

D. Provide interchangeable components of the same manufacture for components being replaced.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

2.05 WARRANTY

A. For all products, where no specific extended warranty periord has been identified, provide no less than manufacturer's standard warranty for product line for quality grade specified.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples. Notify Owner and Architect immediately if supplied product affects installed final work.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS (UAF STANDARD)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section applies directly to them.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submitting closeout documents.

1.03 CLOSEOUT FOLIO

A. Prepare and furnish the Owner with a digital folio containing project documentation; copies of all warranties, manufacturer's instructions, arrangement drawings, and parts identification details on all plumbing, electrical, or mechanical operable equipment provided in the project and required by the contract documents.

B. All deliverables shall be provided on electronic media to the Architect for review during project closeout. The Architect shall transmit approved closeout documentation to the Owner and Commissioning Agent. The Commissioning Agent shall make final recommendations to the Owner.

PART 2 - PRODUCTS

2.01 CERTIFICATES

A. CERTIFICATE OF OCCUPANCY and other legal releases necessary for the Owner's complete and unrestricted use.

B. FINAL LISTING of all subcontractors and material suppliers with their products as used on the project.

C. UPDATED FINAL STATEMENT accounting for additional changes (additions and deductions) to the Contract Sum. Identify amounts for change orders, liquidated damages (addition or deduction), deductions for uncorrected work, deductions for re-inspection payments, and previous payments.

D. THE FINAL PAYMENT REQUEST with final unconditional lien releases from all subcontractors and material suppliers, and other supporting documentation not previously submitted or accepted.

E. LIEN WAIVERS indicating that lien rights are “unconditionally released” for all amounts previously paid by the Owner to the contractor, and “conditionally released” or contingent only upon receipt and bank clearance of the final payment amount yet due to the Contractor.

F. PROVIDE LIEN WAIVERS FROM the Contractor, all subcontractors, sub-subcontractors, suppliers, and any other entities lawfully entitled to file a lien of more than One Thousand Dollars ($1,000.00) arising out of the Work of the Construction Contract. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

G. FORM OF WAIVER: Submit lien waivers on the 1990 Edition of the “Waiver and Release of Lien” form by the Construction Industry Affairs Council of Greater Kansas City Inc (CIAC) or other form provided or approved by the Owner, fully executed in a manner acceptable to Owner.

H. FINAL, COMPLETED PUNCH-LIST(s) with the Contractor's signed statement indicating that all items have been completed or otherwise resolved for acceptance.

I. EVIDENCE OF CONTINUING INSURANCE COVERAGE complying with requirements of the Contract Documents, including certificates of ongoing insurance for products, and completed operations coverage.

J. Contractor Minority Reporting Spreadsheet

2.02 AUTOCAD FILES – COMPREHENSIVE SET

A. Provide a complete set of drawings in AutoCAD format.

B. AutoCAD files should at a minimum include all revisions issued by the Architect but are not expected to incorporate the contractor's redlines unless negotiated by contract.
   1. They should be "ISSUED FOR CONSTRUCTION" but the A/E may remove digital seals for security purposes.
   2. Bind all x-refs to each drawing.
   3. The dwg's file name includes the sheet number & sheet title.

C. All construction drawings should be in the latest version of AutoCAD format.

D. It is highly encouraged that BIM be used for major capital projects. When used, submit both the BIM model and an export of the AutoCAD format.
   1. BIM Model Requirements: LOD 500 not including non-graphical information, per the AIA E202 Building Information Modeling Protocol Exhibit. The contractor may include non-graphical information that can be pulled into the university's CMMS system.

2.03 SPACE PLANS & ROOM LISTS

A. Provide "Space Plans" indicating the floorplans in the current version of AutoCAD, cleaned up (purged) with only the following remaining in the file:
   1. Room Numbers,
   2. Dimensions,
   3. final locations of walls, doors, and windows
   4. room & building sq ft polylines.

B. The commissioning agent will provide a workbook for the General Contractor to fill in all room names and descriptions.

C. UA requires these files about one month before occupancy to facilitate the addition of building info, room numbers, and square footage into the University's databases.

2.04 AS-BUILT DRAWINGS

A. The UA requires the contractor to provide a set of Redline Drawings for use as an "As-Built" reference set for operations and maintenance. If negotiated as a supplemental service, the Architect shall use the Redline Drawing Set to develop an "As-Constructed Record Set."

B. Contractor shall maintain and submit one (1) set of blue- or black-line white "prints" of the Contract Drawings and Shop Drawings with mark-ups including:
   1. IDENTIFY AND DATE each Redline Drawing; include the designation " AS-BUILT DRAWING" in a prominent location.
   2. DO NOT USE AS-BUILT DRAWINGS for construction purposes. Protect the set from deterioration and loss. Provide access to the redlines for the Architect's reference during normal working hours.
   3. MARK the set to show the actual installations where variations from construction documents occur. Require the responsible individuals or entities to prepare the marked-up drawings specific to their scope of Work. Give particular attention to information on concealed elements. Accurately record information in an understandable drawing technique. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, and include cross-references between drawing sets.
      a. MARK WITH ERASABLE, RED-COLORED PENCIL. Use other colors to distinguish between changes for different categories of the Work at the same location.

b. MARK IMPORTANT ADDITIONAL INFORMATION that was either shown schematically or omitted from original Drawings.
c. NOTE CONTRACT MODIFICATION REFERENCES, including Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

C. As-built documents shall include the following details:
1. Indicate final room numbers marked on the final pdf.
2. Shop drawings; fire alarm, fire protection, control dwg's, security, irrigation systems, communication systems, etc.
3. Accurate panel schedules and locations.
4. Location of valves, Breakers, Irrigation control Valves, Cleanouts
5. As-built Infrastructure:
a. Public infrastructure and services shall be surveyed after installation relative to easements, property lines, and rights-of-way. More than a 2 ft deviation of design alignment of shall require new easement dedication or adjustment of the utility/storm drain.
b. Sanitary Sewer, and Storm Drainage elevations must be verified and updated. (Elevations out of design tolerance must be corrected).
c. Street Centerline, Width, Profiles, and Cross slopes shall be verified. More than a 6-inch deviation of design alignment shall require new right-of-way dedication or adjustment of the street section.
d. As-builts should include the following information in a table; Linear Feet of new public streets, sidewalks (categorized by width), waterline, and sanitary sewer. Square feet of newly dedicated right-of-way.
e. Certification that the streets, sidewalk, storm sewer, water, fire line, and sewer lines were installed per approved plans and City of Fayetteville requirements.
f. Provide all Inspection Reports; approved submittals; Data Forms from Utility Specifications (Including Consultant's sewer TV report); compaction test results, etc.
g. The As-Built Final Drainage Report in PDF format updated per as-built invert, slope, inlet opening, road profile, cross slope, etc. Only required for improvements within city right of way.
6. As-built Technology & Communication systems:
a. Record dimensions clearly and accurately to delineate the work as installed; suitably identify locations of all equipment by at least two dimensions to permanent structures. In addition, mark the As Built Drawings to show the precise location of concealed work and equipment, including concealed or embedded raceways and cables and all changes and deviations in the Telecommunications Systems and Components work form that shown on the Contract Documents. All faceplates and Wireless Access Points shall be indicated with label IDs.
b. This requirement shall not be used as authorization to make changes in the layout or work. In a neat and accurate manner, provide a complete record of all revisions of the original drawings, as actually installed. The cost for these documents shall be included in the Contract.
c. Submit electronic copies of the as-built telecommunications cabling schedules as comma-delimited ASCII format files (or other mutually acceptable media and format).
d. Submit electronic copies of final test results for all cabling systems.

2.05 AS-BUILT SPECIFICATIONS

A. Submit one (1) copy of the Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

B. MARK COPY with the proprietary name and model number of products, materials, and equipment AS furnished, including substitutions and product options selected AS furnished, including substitutions and product options selected.

C. NOTE related Change Orders, Record Drawings, and Product Data, where applicable.

2.06 AS-BUILT PRODUCT DATA

A. SUBMIT ONE (1) COPY of each Product Data submittal. Mark one set to indicate the actual product installation where the installation varies from that indicated in Product Data.

B. INCLUDE SIGNIFICANT CHANGES in the product delivered to the Project site and changes in manufacturer's written instructions for installation.

C. NOTE related Change Orders, Record Drawings, and Record Specifications, where applicable.

2.07 MISCELLANEOUS RECORDS

A. ASSEMBLE MISCELLANEOUS RECORDS required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. SUBMIT OTHER MARKED-UP RECORD DOCUMENTS (whether prepared by the GC or by the Owner’s direct suppliers), Operations and Maintenance manuals, damage or settlement survey, extra copies of drawings and specifications, and similar final record information. Provide one set of half-size drawings at the Project Site for the Owner’s use.

2.08 OPERATION AND MAINTENANCE (O&M) DATA

A. ASSEMBLE A COMPLETE SET of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

B. OPERATION DATA:
   1. Emergency instructions and procedures.
   2. System, subsystem, and equipment descriptions, including operating standards.
   3. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
   4. Description of controls and sequence of operations.
   5. Piping diagrams.
   6. Single Line Diagram illustrating fume hood exhaust systems – as installed.

C. MAINTENANCE DATA:
   1. Manufacturer's information, including list of spare parts.
   2. Name, address, and telephone number of Installer or supplier.
   3. Maintenance procedures.
   4. Maintenance and service schedules for preventive and routine maintenance.
   5. Maintenance record forms.
   6. Sources of spare parts and maintenance materials.
   7. Copies of maintenance service agreements.
   8. Copies of warranties and bonds.

D. The Commissioning Agent will provide a workbook for the General Contractor to list all equipment and basic information about the equipment. Submit the populated O&M Data Integration Workbook:
   1. All unique equipment shall be listed separately with basic maintenance information such as filter size, belt size, frequency of lubrication, etc.
      a. Where multiple identical equipment such as the same model light fixture, it is acceptable to list the equipment once for each type.
   2. Reference SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA INTEGRATION

E. Provide O&M Manuals for all Telecommunications Systems, Components, and equipment. include complete cleaning and servicing data compiled in a clear and easily understandable format. Show the model numbers of each piece of equipment with a complete list of replacement parts, capacity ratings, and actual loads.

2.09 WARRANTIES

A. SUBMITTAL TIME: Submit written warranties on request of the Architect for designated portions of the Work where the commencement of warranties other than the date of Substantial Completion is indicated.

B. PARTIAL OCCUPANCY: Submit properly executed warranties within 15 days of completion of designated portions of the Work completed and occupied or used by the Owner during the construction period by separate agreement with Contractor.

C. ORGANIZE WARRANTY DOCUMENTS into an orderly sequence based on the Table of Contents of the Project Manual.

D. PROVIDE COPIES OF EACH WARRANTY within applicable sections of the Operation and Maintenance Manuals.

PART 3 - EXECUTION

3.01 GENERAL INSTRUCTIONS

A. ELECTRONIC AS-BUILT DOCUMENTS: Immediately before the Architect's inspection for Substantial Completion, review the documents with the Architect. When authorized, scan all files, and submit them for the Owner's record and future use.

B. PDF files shall be 400 dpi or higher in resolution.

C. PDF files shall be searchable and Indexed – Bookmarked by Sheet number and name.

D. Where possible .pdf files should retain cross-referenced detail tags.

E. The following describes the file naming convention and format requirements for all electronic construction turnover documents.
   1. Use descriptions that match the document title.
   2. Avoid using abbreviations.
   3. Avoid underscores and special characters such as "&" or "@."

F. Formatting for file types not identified herein should be in PDF format whenever possible.
   1. Grouped by Division\Named by Section Number-Description
   2. Grouped by Discipline Designators\Named by Sheet Number-Description
   3. If the file cannot be related specifically to a Division\Section, the description should sufficiently describe the content.

G. Organize the folio main folders by spec sections:
   1. 01 30 00 Project Management
   2. 01 78 00 Closeout Forms
   3. 01 78 23 Operations and Maintenance Data
   4. 01 78 36 Warranties
   5. 01 78 39 Record Set
      a. Include all scanned plans and specifications.
      b. Include as-built drawings.
   6. 01 91 00 Commissioning

H. Subfolders organization:
   1. Subfolders containing plans shall be organized in groups by the Discipline Designators
   2. Subfolders containing specifications, warranties, training videos, O&M manuals shall be organized by Subgroup \ Division.
   3. Tasks, Report type, other logical groupings

3.02 DRAWINGS – NAMING CONVENTION

A. Save each drawing as a separate file.

B. Drawing sheets should be named using the US National CAD Standard with discipline designators, sheet types, sequence numbers, and sheet descriptions.
   1. Examples:
      a. P102-Plumbing Floor Plan
      b. M601-Mechanical Schedules

c. EL103-Electrical Lighting Plan

C. Drawing Files shall be grouped in subfolders by the Discipline Designators:
1. General (G)
2. Civil (C) and Landscaping (L)
3. Structural (S)
4. Architectural (A)
5. Fire Protection (F)
6. Plumbing (P)
7. Mechanical (M)
8. Controls (MC)
9. Electrical (E)
10. Telecommunications (T)
11. Other (X)
12. Contractor/Shop Drawings (X)

3.03 SPECIFICATIONS – NAMING CONVENTION

A. Create five (5) combined .pdf files composed of all sections within a SUBGROUP. Within the SUBGROUP each SECTION shall be indexed/bookmarked by the Section Number with Description.

B. Each SUBGROUP shall be indexed as follows.
1. SUBGROUP: Procurement and Contracting (00) .pdf
2. SUBGROUP: General Requirements (00-01) .pdf
3. SUBGROUP: Facility Construction Subgroup (02-14) .pdf
4. SUBGROUP: Facility Services Subgroup (21-28) .pdf
5. SUBGROUP: Site and Infrastructure Subgroup (31-34) .pdf

3.04 VIDEOS – NAMING CONVENTION

A. Save each training section as a separate file. File size shall be limited to a maximum of one gigabyte.

B. Videos shall be recorded in one of the following formats: .wmv, .avi, or .mpg.

C. Video files shall be labeled per the following:
1. Section-Description.file-type (26 09 23 Lighting Controls.mpg)
2. Description shall be sufficient to describe the equipment or system and type of training.
3. Organize files by Subgroup\Division\File.

3.05 PRODUCT DATA (SUBMITTALS) – NAMING CONVENTION

A. Product Data Submittals should only include the approved and installed products.

B. Submittal files are to be broken out per system or equipment in a PDF format, labeled by Section-Description.pdf.

C. Organize files by Subgroup\Division\File.

END OF SECTION

SECTION 01 9113
GENERAL COMMISSIONING REQUIREMENT - UAF TEMPLATE

INSTRUCTIONS: CXA TO COMPLETE THE DOCUMENT BASED ON THE PROJECT SCOPE AND REMOVE THE GREEN TEXT BEFORE PRINTING.

PART 1 - GENERAL

2.01 SUMMARY:

A. This section includes general requirements that apply to the implementation of the commissioning process without regard to specific systems, assemblies, and components. General Commissioning of the project will be executed outside of the general contract by an independent consultant to the Owner. This document states the requirements of the Construction Manager/General Contractor to assist the Commissioning Agent in the execution of work.

B. Commissioning is a systematic process of ensuring all building systems perform interactively according to design intent and the Owner's operational needs. Commissioning will encompass and coordinate the traditionally separate functions of system documentation, installation checkout, equipment start-up, control system calibration, point-to-point checkout, testing and balancing, and Functional Performance Testing.

C. Commissioning is intended to achieve the following specific objectives according to the Contract Documents:
   1. Verify that the design of commissioned systems complies with the owner's design guidelines and standards.
   2. Verify and document proper installation and performance of equipment and systems.
   3. Provide the Owner with functional buildings and systems with minimal operational problems post-occupancy.
   4. Verify that applicable equipment and systems are installed according to the contract specifications, manufacturer's recommendations, and industry-accepted minimum standards and that they receive adequate operational checkout by installing contractors.
   5. Verify that close-out documentation, including required CMMS data, is properly completed, and turned over to the University of Arkansas.
   6. Verify that the Owner's operating personnel are adequately trained.
   7. Verify that required system trends are properly set up.

D. Commissioning does not take away from or reduce the responsibility of the Contractors, Subcontractors, and vendors in performing all aspects of work and testing as outlined in the contract documents.

2.02 RELATED REQUIREMENTS

A. Section 01 78 00 – Closeout Submittals - UA Standard

B. Section 01 78 23 – Operation and Maintenance Data Integration - UA Standard

C. Section 01 79 00 – Demonstration and Training

D. Section 01 81 13 – LEED Certification Requirements

E. Section 01 81 19 – Indoor Air Quality Management

F. Section 01 91 15 - Building Enclosure Commissioning Requirements

G. Section 01 91 17 - Enclosure Testing

H. Section 07 08 00 – Commissioning of Building Exterior Enclosure

I. Section 22 08 00 – Commissioning of Plumbing Systems

J. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

K. Section 23 08 00 – Commissioning of HVAC Systems

L. Section 26 08 00 – Commissioning of Electrical System

2.03 REFERENCES

A. The publications listed below are a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. ASSOCIATED AIR BALANCE COUNCIL (AABC)

C. ACG Commissioning Guideline (2005) Commissioning Guideline

D. NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

E. NEBB Commissioning Standard (2009) Procedural Standards for Whole Building Systems Commissioning of New Construction; 3rd Edition.

F. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

G. SMACNA 1429 (1994) HVAC Systems Commissioning Manual, 1st Edition.

2.04 DEFINITIONS

A. Acceptance Phase: Phase of construction after start-up and initial checkout when Functional Performance Tests, O&M documentation review, and training occur.

B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in tested modes according to the Contract Documents.

C. Basis of Design (BOD): Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions, and methods chosen to meet the intent.

D. Commissioning Agent (CxA): An independent party, not otherwise associated with the A/E team members or the Contractor who directs the day-to-day commissioning activities. The CxA contracted by the University of Arkansas will perform commissioning services consistent with the University of Arkansas' criteria for Commissioning Services.

E. Commissioning Plan: An overall plan that provides the structure, schedule, and coordination planning for the commissioning process.

F. Construction Phase: Phase of construction at the beginning of construction when submittal review, commissioning plan, documentation of system verification checks of commissioned systems are completed, and TAB and Controls completion of Work.

G. Contract Documents: Documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, etc.).

H. Control System: System and components associated with the building automation system.

I. Deferred Functional Tests: Functional Performance Tests (FPTs) performed after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.

J. Deficiency: A condition in the installation or function of a component, piece of equipment, or system that is out of compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

K. Functional Completion: All TAB and commissioning responsibilities of the Contractor, (except for seasonal or approved deferred testing and controls training), shall be completed.

L. Functional Performance Test (FPT): Testing of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods.

M. Issues Log: A formal and ongoing record of problems or concerns raised by Commissioning Team members during the commissioning Process.

N. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

O. Occupancy and Operations Phase: Phase of the project after the completion of the Acceptance Phase and the Substantial Completion Date.

P. Pre-functional Checklist (PFC): A list of items provided by the CxA to be inspected and elementary component tests to be conducted to verify proper equipment installation. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operations (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.).

Q. Sampling: Functionally testing on a fraction of the total number of identical or near identical pieces of equipment.

R. Seasonal Performance Tests: FPT that are deferred until the system(s) experience conditions closer to their design conditions.

S. Start-up: The initial starting or activating of dynamic equipment, including executing pre-functional checklists.

T. Substantial Completion Date: The documented date that the Owner accepts the project as ready to be occupied or used for the intended purpose.

U. Test Procedures: The step-by-step process that shall be executed to fulfill the test requirements. The test procedures are developed by the CxA with assistance and coordination from the Construction Team.

V. Trending: Monitoring using the building control system.

W. Warranty Period: Warranty period for the entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year unless otherwise noted in the Contract Documents and accepted submittals.

2.05 ABBREVIATIONS

A. The following are common abbreviations used in the Specifications and in the Commissioning Plan.

B. A/E - Architect and Design Engineers

C. AP – Architectural Program

D. CxA - Commissioning Agent

E. CC - Controls Contractor

F. EC - Electrical Contractor

G. ES - Electronic Security Contractor

H. FPT - Functional Performance Test

I. GC / CMGC - General Contractor or Construction Manager General Contractor

J. MC - Mechanical Contractor

K. MPS – Master Project Schedule

L. OPR – Owner’s Project Requirements

M. PFC – Pre-functional Checklist

N. TAB - Test and Balance Contractor

O. UA – University of Arkansas

2.06 COMMISSIONED SYSTEMS

A. This project will have the following selected building systems commissioned:

CHECK ALL APPLICABLE AS REQUIRED BY PROJECT SCOPE. REMOVE GREEN TEXT BEFORE PRINTING.

A. Building Envelope (List systems specific to the project scope)

1. ☒1.
2. ☒2.
3. ☒3.

4. ☐Building Insulation Installation
5. ☐Building Roof Installation Methods
6. ☐Door & Window (Openings) Installation Methods
7. ☐Water Infiltration / Shell drainage plain.

B. Plumbing Equipment and Systems
1. ☒(Standard) Domestic Water Heating Systems – Mandatory
2. Subsystems: (List subsystems specific to the project scope)
3. ☐1.
4. ☐2.
5. ☐3.
6. ☐ Domestic Water Distribution Equipment
7. ☐ Domestic Fixtures and Piping Systems
8. ☐ Automatic Fixtures
9. ☐ Medical Gas / Laboratory Gas Systems
10. ☐ Emergency Eye Wash & Showers
11. ☐ Landscape Irrigation Systems

C. HVAC Equipment and Systems
1. ☒ (Standard) HVAC Equipment and Systems
2. Subsystems: (List subsystems specific to the project scope)
3. ☐1.
4. ☐2.
5. ☐3.
    a. ☒ (Standard) Energy Management and Automatic Temperature Controls (including an intentional sequence of operation, graphics, and associated interconnection)
    b. ☒ (Standard when included in SOW) Hydronic Piping System including Boilers, Pumps, Heat Exchangers
    c. ☐ (Standard when included in SOW) Process Exhaust Systems including Fume Hoods, Bio-Safety Cabinets, Smoke, or Steam exhaust, and associated Makeup Air Systems
6. ☐Refrigeration Systems
7. ☐Vacuum Systems
8. ☐Compressed Air Systems
9. ☐Chemical Treatment System

D. Electrical Equipment and Systems
1. ☒ (Standard) Power Distribution System (through first 480V distribution boards)
2. Subsystems: (List subsystems specific to the project scope)
3. ☐1.
4. ☐2.
5. ☐3.
    a. ☒ (Standard) Lighting and controls, including daylighting controls for both interior and exterior lighting.
    b. ☒ (Standard) Power Outage Test for Life Safety Systems including interface with defined systems.
6. Interfaced Subsystems: (List systems specific to the project scope)
7. ☐1.
8. ☐2.
9. ☐3.

10. ☒ (Standard when included in SOW) Emergency Power Distribution System
11. Subsystems: (List subsystems specific to the project scope)
12. ☐1.
13. ☐2.
14. ☐3.
15. ☐ Lightning Protection and Grounding Systems
16. ☐ Renewable Energy Systems

E. Other Systems
1. ☐ Security and Access Control System
2. ☐ Information Technology
3. ☐ Landscaping Installation Commissioning

3.02 COMMISSIONING TEAM

A. The Commissioning Agent (CxA)

B. Construction Team:
1. General Contractor / Construction Manager representatives
2. Plumbing Subcontractor Representative
3. Mechanical Subcontractor Representative
4. Electrical Subcontractor Representative
5. Testing, Balancing, and Adjusting Subcontractor Representative
6. Instrumentation and Controls Contractor Representative (IDIQ Contractor)
7. Electronic Security and Alarms Subcontractors (IDIQ Contractor)
8. Equipment Manufacturer's Representatives

C. Owner Team:
1. Owner’s Representative: Construction Coordinator
2. Representatives of the facility user and Facilities Management Operations and Maintenance personnel.

D. Design Team:
1. Architect(s) of Record
2. Engineer(s) of Record
3. Specialty Consultants

3.03 COMMISSIONING TEAM RESPONSIBILITIES

A. In general, the Commissioning Agent shall:
1. Organize and lead the Commissioning Team.
2. Outline and direct commissioning activities specific to the Commissioned Equipment List.
3. Coordinate the commissioning activities with the GC and Owner and help integrate commissioning activities into the Master Project Schedule.
4. Review commissioning documentation, verify start-up activities, and direct equipment testing.
5. Provide on-site observations and performance reporting.
6. Develop and maintain an Issues Log for tracking deficiencies (and resolutions thereof) throughout the commissioning process.
7. Recommend system acceptance/not acceptance to the Owner for each commissioned system.

B. In general, the Construction Team shall:
1. Facilitate and incorporate commissioning activities into the Master Project Schedule (MPS).
2. Attend and participate in commissioning team meetings.
3. Provide all RFI, ASI, PR, and submittal documents related to the commissioned systems to the CxA for review.

4. Provide any equipment, device, or personnel required for access to the commissioned systems and equipment, such as ladders, lifts, and platforms.
5. Provide utilities necessary to execute testing and commissioning, including electricity, water, fuels, chemicals, batteries, and other similar expendable items.
6. Ensure subcontractors and vendors execute their commissioning responsibilities according to the contract documents, the MPS, and the commissioning plan.
7. Ensure subcontractors and vendors work to resolve system deficiencies identified during commissioning, according to the contract documents.

C. In general, the Owner Team shall:
1. Attend and participate in commissioning meetings.
2. Coordinate the attendance of appropriate University personnel for specific commissioning meetings, site tours, training sessions, and system verification.
3. Facilitate Functional Performance Testing Events and coordinate required outages and impacts to facility operations with building occupants.
4. Review and acceptance of certain commissioning deliverables.

D. In general, the Design Team shall:
1. Attend and participate in commissioning team meetings.
2. Provide copies of all project documents including plans, specifications, addenda, ASI, PR's, etc.
3. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings, or equipment documentation are insufficient for writing detailed testing procedures.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Participate in work to resolve system deficiencies identified during commissioning, according to the contract documents.

3.04 COMMISSIONING TEAM DELIVERABLES

A. The Commissioning Agent shall deliver to the Commissioning Team the following:
1. Meeting minutes from all Commissioning Meetings
2. Construction Phase Commissioning Plan
3. Pre-Functional Checklists
4. Site Visit Reports
5. Issues Log
6. Functional Performance Testing Procedures
7. TAB Verification Report
8. Post FPT Acceptance Report

B. The Construction Team shall deliver to the Commissioning Team the following:
1. Equipment documentation including shop drawings, installation instructions, and detailed start-up procedures.
2. A draft version of the O&M Manual within 60 calendar days after review of equipment shop drawings and submittals.
3. Testing Schedule.
4. Start-Up Plan (procedures and schedule).
5. Test and Balance Report; CxA review of the final TAB report is cursory (not for acceptance) and is primarily intended to ensure that the equipment and systems are ready to be functionally tested.
6. Populated Pre-Functional Checklists.
7. Certification of Readiness.
8. Populated Start-up forms and initial checkout/inspection reports.
9. Owner Training Manual(s) and Training Plan.
10. Final O&M Manual.

11. CMMS Data.
12. Closeout Documentation.

PART 2 - PRODUCTS

4.01 TEST EQUIPMENT

A. Testing equipment required to perform commissioning activities shall be provided by the Construction Team for the equipment being tested.

B. Provide certified and calibrated instrumentation required to take measurements of system and equipment performance during Functional Performance Testing.

C. Special equipment, tools, and instruments (only available from the vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and shall be turned over to the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerance specified in the contract documents.

PART 3 - EXECUTION

5.01 CONSTRUCTION PHASE

A. COMMISSIONING AND OAC MEETINGS

B. The CxA will lead a Commissioning “Kickoff” Coordination Meeting no later than 60 days following construction notice to proceed.
   1. to discuss the commissioning process including contract requirements, lines of communication, roles and responsibilities, schedules, documentation requirements, inspection and test procedures, and logistics specific to the project and outlined in this specification.
   2. The Commissioning Team must attend this meeting. The CxA will schedule this meeting through the GC and the Owner.

C. The CxA will lead regular Commissioning meetings. The CxA will coordinate with the Commissioning Team the timing, location, required attendance, and proposed agenda for the meetings.

D. The CxA will participate in the regularly occurring Owner, Architect, Contractor (OAC) meetings to obtain information on construction activities, direct the commissioning process, discuss and resolve the Issues Log, and coordinate and schedule commissioning activities. The CxA’s attendance may be by teleconference or in person.

E. CONSTRUCTION PHASE COMMISSIONING PLAN

F. The CxA will prepare and distribute the Construction Phase Commissioning Plan to the Commissioning Team.

G. The Construction Phase Commissioning Plan will identify the commissioning and testing standards, including pass/fail criteria, and outline the overall commissioning process, the recommended commissioning schedule, the commissioning team members and responsibilities, lines of communication, and documentation requirements for the construction phase of the project.

H. If necessary, a meeting will be scheduled by the CxA to review the Construction Phase Commissioning Plan with the Commissioning Team.

I. SCHEDULING

J. The CxA will coordinate with the GC to review the project’s commissioning activities.

K. To the extent possible, the GC shall integrate all major commissioning activities into the Master Project Schedule (MPS) to occur before substantial completion.

L. The CxA will review the MPS and verify that the activities are properly scheduled. The GC is responsible for coordinating with the CxA to update the timing of commissioning activities as construction progresses.

M. EQUIPMENT SUBMITTALS

N. Simultaneously with providing to the Design Team, the GC shall provide to the CxA all submittals associated with the systems to be commissioned, including shop drawings, equipment submittals, test plans, procedures, reports, and resubmittals.

O. The CxA will review the submittals concurrently with the Design Team, reviewing to the extent necessary to verify that the submittals comply with the contract documents, Owner's Project Requirements, Basis of Design, and the owner's design guidelines.

P. The CxA will provide comments to the Design Team and the Owner.

Q. The Design Team will determine if the CxA's comments will be included in the response to the GC.

R. PRE-FUNCTIONAL CHECKLISTS

S. The CxA will develop and provide the GC with pre-functional checklists for population by the Construction Team. In general, there will be one (1) pre-functional checklist for each commissioned system or piece of equipment including, but not limited to, ductwork, piping, equipment, fixtures (lighting and plumbing), and controls. The checklists include items for physical inspection or testing to demonstrate that the installation and start-up of the equipment is complete.

T. The CxA will provide access to the commissioning software used to document the completion of the pre-functional checklists. The Construction Team is required to provide the necessary hardware to access the commissioning software.

U. The subcontractors, under the GC's direction, shall provide all materials, services, and labor required to perform the pre-functional checklists.
   1. The subcontractors shall indicate the individual executing the pre-functional tasks. The population of a pre-functional checklist item by the team member indicates that the item conforms to the construction documents. Only individuals having direct knowledge and personally witnessing that a line-item task on the pre-functional checklist was performed shall initial or check that item off.
   2. The subcontractors shall execute the pre-functional tasks and populate the checklists before the start-up process. This process should not be delayed till the end of the installation.

V. The GC shall notify the CxA at each phase of construction (installation, piping, ducting, insulation, controls, electrical) as the work is completed and pre-functional checklists are populated so that CxA may verify the proper execution and completion of the pre-functional checklists. The Construction Team shall provide the necessary personnel to assist the CxA in the verification of the pre-functional checklists (e.g. remove FCU covers, open electrical panel covers, etc.).

W. The CxA will monitor PFC population progress by the installing sub-contractors.

X. The completion and acceptance of all pre-functional checklists for the commissioned system is required before functional testing for the commissioned system is allowed to be scheduled.

Y. SITE VISITS

Z. The CxA will execute site visits to evaluate the installation of the commissioned systems. The CxA will coordinate these site visits with the GC and Owner as necessary. Site visit reports will be developed by the CxA and distributed to the Commissioning Team.

AA. ISSUES LOG

BB. The CxA will develop, distribute, and maintain the Issues Log for tracking identification and resolution of deficiencies discovered through commissioning activities. Issues Log will include the date of final resolution of issues as confirmed by the Commissioning Team. The Issues Log will be distributed to the Commissioning Team monthly at a minimum.

CC. At any point during construction, any commissioning team member finding deficiencies may communicate those deficiencies to the CxA for inclusion in the Issues Log.

DD. The Issues Log may be incorporated into the Construction Team Quality Control Plan or Construction Project Management Software to aid resolution.

EE. FUNCTIONAL PERFORMANCE TESTING PROCEDURES

FF. The CxA will develop and distribute to the Commissioning Team the Functional Performance Testing Procedures for each commissioned system at least 60 days before the scheduled start-up for the commissioned systems. The Functional Performance Test Procedures will include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the system performs in accordance with the contract documents.

GG. The Commissioning Team shall review the Functional Performance Test Procedures to confirm accuracy, execution, and completeness. The Commissioning Team shall confirm acceptance of the Functional Performance Test Procedures before executing any equipment start-up.

HH. ACCEPTANCE TESTS AND EQUIPMENT START-UP

II. The Construction Team shall develop detailed equipment Acceptance and Equipment Start-Up Plans and submit them to CxA for review at least 30 days prior to conducting any Acceptance or Equipment Start-Up activities. Modify the Acceptance and Equipment Start-Up Plan as directed by CxA.

JJ. The CxA will provide the GC with a list of all acceptance tests and equipment start-ups required to be witnessed by the CxA. The GC shall notify the CxA at least 72 hours before the execution of the acceptance tests and equipment start-up requiring witnessing by the CxA.

KK. The Construction Team shall execute and document the acceptance tests and equipment start-up in accordance with the contract documents.
1. Only individuals having direct knowledge that a line-item task was performed will initial or check that item off.
2. The Construction Team shall itemize deficiencies and incomplete acceptance tests and equipment start-up.
3. Documentation shall be provided to CxA within two working days of completion.

LL. The Construction Team shall correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to the Owner. The GC and CxA will review and monitor correction activities.

MM. Any acceptance testing or equipment start-up testing marked as complete which is later found to be incomplete and causes re-verification work by CxA or delays the completion of the Functional Performance Testing will be back charged to the responsible party.

NN. CERTIFICATE OF READINESS

OO. The GC will issue a Certificate of Readiness for each of the commissioned systems, certifying that the system is ready for Functional Performance Testing. The Certificate of Readiness will include a statement that all Pre-Functional Checklists for the system are complete, and include all acceptance test reports, start-up reports, approved Testing, Adjusting, and Balancing Reports, HVAC Controls Start-Up Reports (Point-to-Point Reports), to the extent applicable to the system.

PP. Functional Performance Testing for any system will not be scheduled until the Certificate of Readiness for that system is received by the CxA.

5.02 ACCEPTANCE PHASE

A. FUNCTIONAL PERFORMANCE TESTING

B. Once the Certificate of Readiness and all associated documentation for a system has been provided by the GC to the CxA, the CxA will schedule Functional Performance Testing for that commissioned system through the GC.

C. The CxA will direct all Functional Performance Tests for the systems to be commissioned, defining the order of components and systems to be tested for each commissioned system.

D. Participation from the Commissioning Team during Functional Performance Testing will be determined and documented by the CxA for each system to be commissioned. Commissioning

Team members shall attend and participate in FPT events as assigned. The CxA may abort the FPT event if the required commissioning team members are not present.

E. The CxA will document the results of each Functional Performance Test. Items of non-compliance in material, installation, or setup are noted for the Construction Team to correct. Corrections of minor deficiencies identified may be made during the testing. All deficiencies or non-conformance issues identified during Functional Performance Testing shall be corrected and re-tested at no additional cost to the Owner.

F. Functional Performance Testing shall be performed as soon as all contract work is completed, regardless of the season.

G. Functional Performance Testing for all commissioned systems shall be completed before Substantial Completion.

H. Functional Performance Testing shall include an actual interruption of primary power to witness and document the proper operation of life safety systems and all other systems or equipment on an emergency power circuit.

I. ACCEPTANCE

J. After completion of the Functional Performance Test Procedures for each commissioned system, the CxA will indicate the acceptance of the commissioned system.

K. Once all Functional Performance Test Procedures are acceptably complete, the CxA will provide a Post FPT Acceptance Report, recommending in writing acceptance/non-acceptance of the commissioned systems to the Owner.

L. TAB VERIFICATION

M. TAB Verification as outlined in the contract documents shall be coordinated by the GC and executed by the Construction Team.

N. Participation during TAB Verification shall be provided as per the contract documents.

O. TAB documentation shall be provided to the CxA, who shall recommend to the Owner acceptance or rejection of the TAB Verification.

P. Any issues identified during TAB Verification shall be corrected and re-tested at no additional cost to the Owner.

Q. OPERATION AND MAINTENANCE DATA

R. The contractor shall compile operations and maintenance data for all required equipment according to Section 01 78 23 – Operation and Maintenance Data Integration - UA Standard.

S. The contractor shall provide the final O&M manuals before Owner training sessions.

T. DEMONSTRATION AND TRAINING

U. The Contractor shall attend the Owner Training Coordination Meeting facilitated by the CxA.

V. The contractor shall compile O&M manuals and documentation as needed for the development of a training plan according to Section 01 79 00 – Demonstration and Training

W. CLOSEOUT DOCUMENTATION

X. The Contractor shall attend the Closeout Documentation Meeting facilitated by the CxA.

Y. The contractor shall compile closeout documentation for all required equipment according to the specification for the equipment or system being commissioned consistent with Section 01 78 00 – Closeout Submittals - UA Standard.

5.03 OCCUPANCY AND OPERATIONS PHASE

A. DEFERRED FUNCTIONAL PERFORMANCE TESTING

B. Prior to the substantial completion date, if any test, equipment or system cannot be completed due to a required occupancy condition, ambient condition, or other situation, the execution of the Functional Performance Testing may be delayed upon approval of the CxA and Owner.

C. Deferred Functional Performance Testing must be executed as outlined in Section 3.1 – INITIAL FUNCTIONAL PERFORMANCE TESTING above.

D. SEASONAL FUNCTIONAL PERFORMANCE TESTING

E. In addition to the Initial FPT events outlined in Section 3.1, Seasonal Functional Performance Testing of the HVAC Systems must be performed under full-load conditions during peak heating and cooling seasons during outdoor air condition design extremes.

F. The CxA shall schedule Seasonal Functional Performance Testing with the Commissioning Team.

G. The CxA will lead and document all Seasonal Functional Performance Testing for the HVAC system.

H. The GC and Construction Team will perform the Seasonal Functional Performance Tests in the presence of the CxA, providing all the necessary equipment and personnel to execute the FPT.

I. Participation from the Commissioning Team during Seasonal Functional Performance Testing will be determined and documented by the CxA. Commissioning Team members shall attend and participate in FPT events as assigned. Seasonal FPT may be aborted by the CxA if required commissioning team members are not present.

J. The CxA will document the results of the Seasonal Functional Performance Tests.

K. END OF WARRANTY PERIOD INSPECTION AND MEETING

L. Ten months into the warranty period the CxA will visit the project concurrent with the End of Warranty Period Meeting to inspect the commissioned systems and review building operation with the building maintenance staff. The CxA will identify and document deficiencies in the commissioned systems to operate in accordance with the contract documents.

M. The CxA will evaluate trend data, request CMMS data from the owner, and provide analysis. The results of this analysis shall be provided to the Commissioning Team with any identified deficiencies and the proposed corrective action.

N. The CxA will participate in the End of Warranty Period Meeting coordinated by the GC.

O. CxA will provide a written report (Final Commissioning Report) detailing the End of Warranty Period meeting.

P. LESSONS LEARNED MEETING

Q. The CxA will lead a Lessons Learned Meeting concurrent with the End of Warranty Meeting. The agenda shall cover project benefits, improvement opportunities for future projects with the Owner, and other pertinent information. The Commissioning Team must attend this meeting. The CxA will schedule this meeting with the GC, design team, and the Owner.

R. The CxA will provide the meeting minutes from the Lessons Learned Meeting.

END OF SECTION

SECTION 02 4113
SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Selective demolition work, complete, as indicated, specified, and required for new work, including removal and disposal of demolished materials.

B. Removal, protection, and storage of items designated to be reused.

C. Removal, protection, and delivery of items designated as Owner's salvage to location as directed by Owner.

1.02 RELATED WORK

A. Not in this Phase

1.03 SUBMITTALS:

A. Before commencing selective demolition work, submit for review and approval of the Engineer, a schedule showing the commencement, order, and completion dates for the various parts of this work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise protection.

B. Before starting any work relating to existing utilities that will temporarily discontinue service to adjacent buildings, notify the Engineer / Owner 72 hours in advance and obtain approval before proceeding with work. Do not disconnect or disrupt service without Engineer's prior approval.

1.04 PROJECT CONDITIONS:

A. Condition of Structure: Owner assumes no responsibility for actual condition of items or portions of structures to be demolished.

B. Salvageable Items:

C. Salvage items indicated. Store at location as directed by Owner.

D. Items indicated to be removed, and not designated for Owner's salvage or for reuse, may be salvaged by the Contractor. Transport salvaged items from site as they are removed. Storage or sale of removed items on site will not be permitted.

E. Protections:

F. Provide protective measures as required to protect personnel and general public from injury due to selective demolition work.

G. Provide adequate fire protection in accordance with local Fire Department requirements.

H. Damages: Promptly repair, to the satisfaction of the Engineer, damages caused to contents by demolition work or due to insufficiency of protection provided, at no cost to Owner. Replace damaged work, as directed by the Engineer, if not satisfactory.

I. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

J. Explosives: Use of explosives will not be permitted.

K. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practicable level. Comply with governing regulations pertaining to environmental protection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DEMOLITION

A. Refer to drawings and provide selective demolition as indicated and as required for new work.

B. Proceed in a systematic manner. Use such methods as required to complete work in accordance with demolition schedule and governing regulations.

C. Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools: do not use power driven impact tools.

3.02 DISPOSAL OF DEMOLISHED MATERIAL

A. Remove debris, rubbish, and other materials resulting from demolition operations as the work progresses. Transport and legally dispose of materials off site. Burning of debris will not be permitted on site.

3.03 CLEAN UP AND REPAIR

A. Upon completion of selective demolition work, remove tools, equipment and demolished materials from site. Remove protections.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02 4114
UTILITY LINE BORES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing encasement pipe jacked through bored tunnel for crossing of utility pipelines under roadways and railroad tracks where noted on Drawings.

B. Providing sand packing of encasement pipe around pressure lines.

C. Pulling or jacking carrier pipe through encasement pipe.

D. Providing brick closures at ends of encasement pipe.

1.02 RELATED WORK

A. Section 33 3100 – Sanitary Sewer Gravity Line.

B. Utility crossings under existing streets where boring is noted.

1.03 REFERENCE

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 139: Specification for Electric-Fusion (ARC) – Welded Steel Pipe (sizes 4 inch and over).
   2. ASTM D41.1 Specification for Spiral-Welded Steel or Iron Pipe.

B. American Welding Society (AWS):
   1. AWS D1.1 Structural Welding Code.

1.04 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 MATERAILS

A. Encasement pipe: Smooth wall steel pipe conforming to ASTM A139 (Grade B), ASTM A211, or AWWA C202 (Grade B) with ends prepared for welded joints.

B. Welding materials: Type required materials being welded and conforming to applicable AWS Specifications.

C. Sand: Clean industrial sand, concrete sand, masonry sand, or other type approved by Engineer.

D. Skids or chocks: Pressure-treated wood shaped to fit underside of carrier pipe and bottom of encasement pipe. Size skids to allow carrier pipe to be installed at designated grade.

E. Furnish stainless steel bands to secure skids or chocks to carrier pipe.

F. Brick: New or used day brick; or concrete brick.

G. Mortar: Type “M”.

PART 3 EXECUTION

3.01 SUBSURFACE INVESTIGATION

A. Do not set up equipment or begin excavating pit on state highway without permission of Arkansas State Highway and Transportation Department District Engineer or his authorized representative. Refer to Section 01 1000.

B. Do not begin boring and jacking operation for railroad crossings without permission of railroad company’s Area Road master or his designated representative.

3.02 INSTALLATION, ENCASEMENT PIPE

A. General: Install encasement pipe at grade and alignment shown on Drawing. Allow for height of skids or chocks when establishing grade for gravity line encasement pipe.

B. Bores:
   1. Excavate pits and trenches required at each side of crossing to minimum width and length necessary for boring and jacking operation and carrier pipe installation.
   2. Carefully set timer or steel guide rails in pit to attain specified grade and alignment.
   3. Keep pit pumped free of standing water. Maintain pit bottom to provide stable base for rails and equipment and firm footing for workmen. Granular material used in bottom of pit will not be paid for as “Extra gravel in trench”.
   4. Provide temporary sheeting and bracing as necessary to prevent earth-slides. Leave in place until it can be safely removed.
   5. Bore tunnel and simultaneously jack encasement pipe forward one section at a time. Connect sections by full penetration butt welding performed in accordance with AWS D1.1.
   6. Remove excavated soil from boring operation as it enters pit and dispose of it offsite.

C. Open Cut:
   1. Trenches shall be constructed as described in Section 33 3100.
   2. Provide temporary sheeting and bracing as necessary to prevent earth-slides. Leave in place until it can be safely removed.
   3. Connect encasement pipe sections by full penetration butt welding performed in accordance with AWS D1.1.

3.03 INSTALLATION, CARRIER PIPE

A. General: Joint pipe as specified in Sections 33 1100, 33 1219, and 33 3100, as applicable. Pull or jack carrier pipe through encasement pipe. Do not allow cables or jacks to be in direct contact with carrier pipe while pulling or jacking pipe. Use timber or padded steel member.

B. Pressure lines: Install in encasement pipe with weight of pipe resting on pipe barrels and sliding directly on bottom of encasement pipe.

C. Gravity lines: Strap skids or chocks to carrier pipe, two per pipe length near ends. Refer to Detail Drawings bound in Project Manual.

3.04 INSTALLATION, SAND

A. Pressure lines: Fill void between encasement pipe and carrier pipe with sand. Install vertical single wythe mortared brick wall in ends of encasement pipe, sealing around carrier pipe.

3.05 BACKFILL

A. Use material excavated from pit.

B. Backfill against ends of encasement pipe.

C. Backfill pit and around carrier pipe in same manner as specified in Sections 33 3100 and 33 1219.

3.06 CLEANUP

A. Cleanup ground surface around work area in same manner as specified for line work in Sections 33 1219 and 33 3100.

END OF SECTION

SECTION 03 1000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Form-facing material for cast-in-place concrete.

B. Shoring, bracing, and anchoring.

C. Related Requirements:

D. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.

1.02 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.03 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

B. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."

C. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

1. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

PART 3 EXECUTION

3.01 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes and.

C. Limit concrete surface irregularities as follows:

D. Surface Finish-1.0: ACI 117 Class D, 1 inch.

E. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.

F. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

G. Construct forms tight enough to prevent loss of concrete mortar.

H. Minimize joints.

I. Exposed Concrete: Symmetrically align joints in forms.

J. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

K. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

L. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

M. Install keyways, reglets, recesses, and other accessories, for easy removal.

N. Do not use rust-stained, steel, form-facing material.

O. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

P. Provide and secure units to support screed strips

Q. Use strike-off templates or compacting-type screeds.

R. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

S. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.

T. Locate temporary openings in forms at inconspicuous locations.

U. Chamfer exterior corners and edges of permanently exposed concrete.

V. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

W. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

X. Determine sizes and locations from trades providing such items.

Y. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

Z. Construction and Movement Joints:

AA. Construct joints true to line with faces perpendicular to surface plane of concrete.

BB. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

CC. Place joints perpendicular to main reinforcement.

DD. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
    1. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

EE. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

FF. Space vertical joints in walls as indicated on Drawings.
    1. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

GG. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

HH. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.

II. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

JJ. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

KK. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

LL. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

B. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

C. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

D. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

E. Install dovetail anchor slots in concrete structures, as indicated on Drawings.

F. Clean embedded items immediately prior to concrete placement.

3.03 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

C. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

D. Clean and repair surfaces of forms to be reused in the Work.

E. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.

F. Apply new form-release agent.

G. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

H. Align and secure joints to avoid offsets.

I. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

D. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

B. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2014.

C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

D. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.

1.02 SUMMARY

A. Section Includes:
   1. Steel reinforcement bars.
   2. Welded-wire reinforcement.

B. Related Requirements:
   1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction contraction and isolation joints.
      c. Steel-reinforcement installation.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Each type of steel reinforcement.
   2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:
   1. Include placing drawings that detail fabrication, bending, and placement.
   2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, , tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
   1. Location of construction joints is subject to approval of Architect.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Welding certificates.
   1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

C. Material Test Reports: For the following, from a qualified testing agency:
   1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D1.4M.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage .
   1. Store reinforcement to avoid contact with earth.

PART 2 PRODUCTS

2.01 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.02 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 EXECUTION

3.01 PREPARATION

A. Protection of In-Place Conditions:
   1. Do not cut or puncture vapor retarder.
   2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.02 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.
   1. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.
   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
      a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

3.03 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement.
   2. Continue reinforcement across construction joints unless otherwise indicated.
   3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.04 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Steel-reinforcement placement.

END OF SECTION

SECTION 03 3000
IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
   2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

B. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2012.

C. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

D. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

F. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

H. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

I. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014.

J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

L. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

M. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

N. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

P. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

Q. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following.
   1. Portland cement.
   2. Fly ash.
   3. Slag cement.
   4. Performance-based hydraulic cement
   5. Aggregates.
   6. Admixtures:
      a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
   7. Color pigments.
   8. Fiber reinforcement.
   9. Vapor retarders.
   10. Floor and slab treatments.
   11. Liquid floor treatments.
   12. Curing materials.
      a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
   13. Joint fillers.
   14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:
   1. Mixture identification.
   2. Minimum 28-day compressive strength.
   3. Durability exposure class.
   4. Maximum w/cm.
   5. Slump limit.
   6. Air content.
   7. Nominal maximum aggregate size.
   8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

C. Shop Drawings:
   1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
      a. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
   1. Installer: Include copies of applicable ACI certificates.
   2. Ready-mixed concrete manufacturer.
   3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Fiber reinforcement.
   4. Vapor retarders.

C. Material Test Reports: For the following, from a qualified testing agency:
   1. Portland cement.
   2. Fly ash.
   3. Blended hydraulic cement.
   4. Aggregates.
   5. Admixtures:

a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
   1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

C. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
   1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.08 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   3. Do not use frozen materials or materials containing ice or snow.
   4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
   5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
   1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type II Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F. Fly ash shall not be used in exposed concrete.

C. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

D. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.03 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride .
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

C. Water: Potable or complying with ASTM C1602/C1602M.

2.05 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

2.06 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash or Other Pozzolans: 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.07 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.
   1. Exposure Class: ACI 318 F0 S0 W0 C1.
   2. Minimum Compressive Strength: As indicated at 28 days.
   3. Maximum w/cm: 0.50.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

B. Class B: Normal-weight concrete used for foundation walls.
   1. Exposure Class: ACI 318 F2 S0 W0 C1.
   2. Minimum Compressive Strength: As indicated at 28 days.
   3. Maximum w/cm: 0.45.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content:
      a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
   6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.
   1. Exposure Class: ACI 318 F0 S0 W0 C0.
   2. Minimum Compressive Strength: As indicated at 28 days.
   3. Maximum w/cm: 0.50.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content:
      a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
   6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Class D: Normal-weight concrete used for interior suspended slabs.
   1. Exposure Class: ACI 318 F0 W0 C0.
   2. Minimum Compressive Strength: As indicated at 28 days.
   3. Maximum w/cm: 0.50.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content:
      a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
   6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

E. Class E: Normal-weight concrete used for interior metal pan stairs and landings:
   1. Exposure Class: ACI 318 F0 S0 W0 C0.
   2. Minimum Compressive Strength: 3000 psi at 28 days.
   3. Maximum w/cm: 0.53.
   4. Maximum Size Aggregate: 1/2 inch.
   5. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
   6. Air Content: 0???Insert number??? percent, plus or minus 0.5 percent at point of delivery.
   7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
   8. Retarding Admixture: Not allowed.
   9. Accelerating Admixture: Not allowed.

F. Class D: Normal-weight concrete used for exterior retaining walls.
   1. Exposure Class: ACI 318 F2 S0 W1 C1.

2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content:
    a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M , and furnish batch ticket information.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
    1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
    2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
    1. Daily access to the Work.
    2. Incidental labor and facilities necessary to facilitate tests and inspections.
    3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
    4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
    1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
    3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.04 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
    1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
    2. Place joints perpendicular to main reinforcement.
        a. Continue reinforcement across construction joints unless otherwise indicated.
        b. Do not continue reinforcement through sides of strip placements of floors and slabs.
    3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
    4. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth???Insert depth??? of concrete thickness as follows:
   1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Doweled Joints:
   1. Install dowel bars and support assemblies at joints where indicated on Drawings.

E. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
   2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Do not place concrete floors and slabs in a checkerboard sequence.

2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.06 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
   3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
   2. If forms remain during curing period, moist cure after loosening forms.
   3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
      b. Continuous Sprinkling: Maintain concrete surface continuously wet.
      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
      d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
      e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
         1) Recoat areas subject to heavy rainfall within three hours after initial application.
         2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.
   2. Interior Concrete Floors:
      a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
         1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            (a) Lap edges and ends of absorptive cover not less than 12 inches.
            (b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
         2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
            (a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            (b) Cure for not less than seven days.
         3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

(a) Water.
(b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
   1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
      (a) Lap edges and ends of absorptive cover not less than 12 inches.
      (b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
   2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
      (a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      (b) Cure for not less than seven days.
   3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
      (a) Water.
      (b) Continuous water-fog spray.
c. Floors to Receive Polished Finish: Contractor has option of the following:
   1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
      (a) Lap edges and ends of absorptive cover not less than 12 inches.
      (b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
   2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
      (a) Water.
      (b) Continuous water-fog spray.
d. Floors to Receive Chemical Stain:
   1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
   2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
   3) Butt sides of curing paper tight; do not overlap sides of curing paper.
   4) Leave curing paper in place for duration of curing period, but not less than 28 days.
e. Floors to Receive Urethane Flooring:
   1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
   2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
   3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
   4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
f. Floors to Receive Curing Compound:
   1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:
1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.07 TOLERANCES

A. Conform to ACI 117.

3.08 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.09 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:
1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C172/C172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; .

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of three field-cured specimens at seven days and one set of two specimens at 28 days.
   c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
       1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.10 PROTECTION

A. Protect concrete surfaces as follows:
   1. Protect from petroleum stains.
   2. Diaper hydraulic equipment used over concrete surfaces.
   3. Prohibit vehicles from interior concrete slabs.
   4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 03 3511
CONCRETE FLOOR FINISHES

PART 1 GENERAL V.24

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.04 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet square.

C. Locate where directed and may remain as part of final work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.06 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. SLC-01: Aliphatic Urethane Clear Sealer:
   1. Use at the following locations: All locations SLC-01 in finish schedule.

B. At Concrete to receive polish, reference Polished

2.02 COATINGS

A. Clear Topical Sealer:
   1. Composition: Aliphatic Urethane- Single Component - Clear.
   2. Products:
      a. Elite Crete: AUS-V: www.elitecrete.com
      b. Euclid Chemical Company: www.euclidchemical.com
      c. Sika Corporation: www.sikausa.com
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Accessories:
   1. Primers.
   2. Cleaning agents.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Remove all construction dirt, debris, staining, paint, sealants, mastic, drywall joint compound, etc. from surface of concrete to provide a blemish free surface. Physical and mechanical cleaning required; chemical cleaning may be necessary upon approval only. The use of light sanding and/or polish grinding is acceptable at hard to clean surfaces.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply primers and coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION

SECTION 03 5400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.03 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

B. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

D. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

E. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

F. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2021.

G. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Manufacturer's Instructions.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility or flame spread requirements.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

1.08 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cementitious Underlayment:
   1. USG; Levelrock® Series 2500 Floor Underlayment ; Levelrock® Series 2500 Floor Underlayment: www.usg.com/#sle.

B. Sound Control Mat:
   1. USG; Levelrock® SAM-N12 Sound Attenuation Mat: www.usg.com/#sle.

2.02 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum _____ pounds per square inch after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
   3. Density: 125 pounds per cubic foot, nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Sound Control Mat: Sheet material, perimeter isolation strip, and tape; as recommended by the underlayment manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1-1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Concrete: Prepare surfaces according to ICRI 310.2R, _____.

C. Wood: Install metal lath for reinforcement of underlayment.

D. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

E. Vacuum clean surfaces.

F. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

G. Close floor openings.

H. Install sound control mat in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

F. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 4000 - Quality Requirements.

3.06 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2010.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2023.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

L. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.

M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.

N. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.

O. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.

P. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.

R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.04 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Types as scheduled in this section.
   2. Color: Mineral pigments added as required to produce approved color sample.
   3. Manufacturers:
      a. Substitutions: See Section 01 6000 - Product Requirements.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

C. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Color as required to produce approved color sample

D. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.

E. Blended Masonry and Portland Cement Grout: ASTM C476.

F. Packaged Dry Mortar: ASTM C387/C387M, Type N or S, using gray or white color cement as required to achieve desired mortar color.

G. Hydrated Lime: ASTM C207, Type S.

H. Quicklime: ASTM C5, non-hydraulic type.

I. Mortar Aggregate: ASTM C144.

J. Grout Aggregate: ASTM C404.

K. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).
   2. Manufacturers:
      a. Davis Colors: www.daviscolors.com/#sle.
      b. Lambert Corporation: www.lambertusa.com/#sle.
      c. Solomon Colors: www.solomoncolors.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

L. Water: Clean and potable.

M. Bonding Agent: Latex type.

N. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
    1. Performance of Mortar with Integral Water Repellent:
        a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
            1) No water visible on back of wall above flashing at the end of 24 hours.
            2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
            3) No more than 25 percent of wall area above flashing visibly damp at end of test.
        b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
        c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
        d. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
    2. Use only in combination with masonry units produced with integral water repellent admixture.

2.03 MORTAR MIXES

A. Ready Mixed Mortar: ASTM C1142, Type RN.

B. Mortar for Unit Masonry: ASTM C270, Property Specification.

2.04 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

2.05 GROUT MIXES

A. Bond Beams, Lintels, and Reinforced Cells: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
    1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.

2.06 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

C. Perform practices for cold or hot weather requirements.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 60 inches maximum for fine and course grout with 2 inches maintained clearances around reinforcing. Refer to structrual drawings for additional restrictions.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FINAL TOUCH UP

A. CLEANING: Clean mortar from masonry or masonry veneer to observe mortar color tone / consistency.

B. Stain surface of exposed mortar as required where discoloration of mortar appears from field tone/color. Repeat as necessary to obtain consistent color tone. Coordinate locations requiring staining with architect.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Clay facing brick.

B. Reinforcement and anchorage.

C. Flashings.

D. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

F. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

G. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units; 2025.

H. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2025.

I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2024.

J. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.

K. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.

L. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

M. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls; 2025.

N. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2005.

O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers. Mock-up to be complete and approved prior to scheduling meeting.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

1.05 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 6 feet long by 6 feet high; with full masonry system to include mortar, accessories, structural backup, wall openings, flashings (with lap joint, corner, and end dam), wall insulation, and final cleaning in mock-up.

B. Locate where directed.

C. Mock-up may not remain as part of the Work, unless approved by Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store ceramic glazed masonry units and pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

PART 2 PRODUCTS

2.01 BRICK UNITS

A. Manufacturers:
   1. Belden Brick; Antique Colonial Series: www.beldenbrick.com
   2. Columbus Brick Company: Heritage Collection: www.columbusbrick.com
   3. Substitutions: See section 01 6000 - Product Requirements.

B. Facing Brick Type 1: ASTM C216, Type FBA, Grade SW.
   1. Columbus; Heritage Collection
   2. Color and texture: Yorktown Genuine Papercut: Painter Brick
   3. Size: Modular
   4. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

C. Facing Brick Type 2: ASTM C216, Type FBA, Grade SW.
   1. Belden Brick: Antique Colonial: Brick Blend
   2. Color: Belcrest 310. Sandmold
   3. Size:Modular
   4. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
      a. B.O.D. - Cherokee Brick and Tile Co. Arches and Shapes
      b. Use Belden Brick equivalent.
         1) 5 Course/ 2-3 Piece Jack Arch Modular Brick
         2) Bullnose
            (a) Header WB-H
            (b) Outside Corner WB-OC
            (c) Inside Corner WB-IC
         3) Cove
            (a) Stretcher WC-S
            (b) Outside Corner WC-OC
            (c) Inside Corner WC-IC

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com.
   2. Hohmann & Barnard, Inc; www.h-b.com/#sle.
   3. WIRE-BONDwww.wirebond.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

F. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
   2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.

G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Concrete or CMU backing: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dipped galvanized to ASTM A 153/A 153M, Class B, installed in recessed dovetail slot or surface mounted to face of wall.
   2. Steel or Wood Stud backing: 2 piece anchor designed for use with continuous insulation and contains gasketting for sealing at weather barrier penetration.
      a. Manufacturers:
         1) Hohmann and Barnard: 2-seal or approved equal. www.h-b.com.
         2) Rodenhouse: Pos-i-tie Veneer Anchoring System. Thermal Grip Brick Tie Washer. www.rodenhouse-inc.com
         3) Heckmann Building Products: Pos-i-tie Veneer Anchoring System. www.heckmannbuildingprods.com
      b. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
      c. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
      d. Vertical adjustment: Not less than 2 inches.
      e. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter. Provide when project is located in Seismic Zone D or per Structural Plans indicate.

2.04 FLASHINGS

A. Copper/Polymer Film or Fabric Flashing: 5 oz/sq ft copper sheet laminated between two sheets of polymer or fiberglass fiber-reinforced film.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc; Copper-Fabric NA: www.h-b.com/#sle.
      b. York Manufacturing, Inc; Multi-Flash 500 Series: www.yorkmfg.com/#sle.

c. WireBond Copper Seal Flash. www.wirebond.com
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Termination Bars: Stainless steel or aluminum; compatible with membrane and adhesives.

C. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.05 ACCESSORIES

A. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
a. Manufacturers:
1) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
2) CavClear/Archovations, Inc: www.cavclear.com.
3) Substitutions: See Section 01 6000 - Product Requirements.

B. Weeps:
1. Type: Polyester mesh.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

D. Steel Loose Lintels: Steel, hot dipped galvanized. See Division 05.

E. Sand; white or tan for use on masonry joint sealants.

PART 3 EXECUTION

3.01 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Protect all substrates from damage during placement of masonry. Repair any damage caused to substrate prior to concealing with masonry.

C. Coordinate installation requirements of this section of load-bearing CMU walls with Structural drawings. The more stringent instruction of the two takes precedent.

D. Coordinate the installation of any recessed items in masonry walls with other trades. Do not conceal work of other trades prior to their completion.

3.02 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Units:
1. Bond: Running.
2. Coursing: Three units and three mortar joints to equal 8 inches.

3. Mortar Joints: TBD based on Mockup Review.

3.04 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

3.05 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls, minimum of two weeps per opening.

3.06 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents. Mortar diverter to be installed in full depth of masonry air cavity.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall or masonry type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

C. Masonry Veneer Anchors through Weather Barrier / Insulation:
   1. Installation before weather barrier: Ensure perimeter of anchors are smooth and consistent as required by weather barrier manufacturer.
   2. Installation after weather barrier: Install as to not damage weather barrier. Patch any damage on the exterior with plastic flashing or sealant and patch holes on interior with sealant.
   3. Installation after weather barrier / rigid insulation: Install as to not damage weather barrier concealed behind rigid insulation board. Patch any holes or damage done to weather barrier from the exterior by removing rigid insulation and repairing with plastic flashing. Patch holes through weather barrier and sheathing from interior with sealant.

D. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction. Ends of flashing to contain premanufactured or field folded water tight end dams.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.
   4. Install flashing at rowlock water table sills, masonry and/or stone caps, pedestals, etc where masonry is exposed to above whether indicated on plan or not. Grout masonry solid at said locations.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Anchor vertical leg of flashing into backing with a termination bar and sealant. Space fasteners for termination bar at no more than 12 inches on center and into solid blocking.

C. Extend metal flashings to within 1/4 inch of exterior face of masonry. Flashing should not be visible from the exterior.

D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 LINTELS

A. Refer to Structural Drawings for Lintel Schedule.

B. Install loose steel lintels over openings. All exterior exposed steel used in lintels are to be hot dip galvanized.

C. Refer to Lintel Schedule for minimum bearing dimension on each side of opening.

D. Maintain minimum 4-6 inch bearing on each side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joint in accordance with Section 07 9005 for sealant performance.

E. Form expansion joint as detailed on drawings.

F. Space masonry control joints at intervals no more than 20 feet apart horizontally and vertically and as indicated on drawings.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000. Coordinate test requirements with Structural Special Inspection per structural and ICC.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution. Clean faces of masonry no longer than 2 weeks from installation. Inadequate cleaning is considered defective work.

D. Use non-metallic tools in cleaning operations.

E. Stain surface of mortar where discoloration appears from field tone/color. Coordinate locations requiring staining with architect.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 2200
CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Masonry-joint reinforcement.
   2. Miscellaneous masonry accessories.

B. Products Installed, but Not Furnished, under This Section:

C. Related Requirements:
   1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
   2. Section 071900 "Water Repellents" for water repellents applied to surface of unit masonry assemblies.
   3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
   4. Section 089516 "Wall Vents" for wall vents (brick vents).

1.02 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

C. Exposed: Weather-exposed side of a constructed wall.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

D. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.

E. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

G. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

H. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.

I. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.

J. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

K. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.

L. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

M. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.

N. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2012.

O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
   3. Lintel design and types required.

C. Samples for Initial Selection:

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   3. Mortar admixtures.
   4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   5. Grout mixes. Include description of type and proportions of ingredients.
   6. Reinforcing bars.
   7. Joint reinforcement.
   8. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
   2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. Weather Procedures:
   1. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
   2. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

PART 2 PRODUCTS

2.01 SOURCE LIMITATIONS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with the provisions of the following codes, specifications, and standards, except as otherwise shown or specified:
   1. TMS 402/602:
      a. Maintain one copy of the standard in Project field office at all times during construction. Contractor's supervisory personnel are to be thoroughly familiar with this material as it applies to Project.

2.03 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
   2. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2.04 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.05 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime or mortar cement mortar unless otherwise indicated. Masonry cement shall not be used for mortar.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Specification. Provide the following types of mortar for applications stated unless another type is indicated .
   1. For masonry below grade or in contact with earth, use Type S.
   2. For reinforced masonry, use Type S.
   3. For for interior load-bearing wallsand for other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
   1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.
   3. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Temperature Control: Perform temperature-sensitive construction procedures while masonry Work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated

minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 deg F.

1. 40 to 32 Deg F (4 to 0 Deg C):
    a. Mortar: Heat mixing water to produce mortar temperature between 40 and 120 deg F.
    b. Grout: Follow normal masonry procedures.
2. 32 to 25 Deg F (0 to Minus 4 Deg C):
    a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F; maintain temperature of mortar on boards above freezing.
    b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
3. 25 to 20 Deg F (Minus 4 to 7 Deg C):
    a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F; maintain temperature of mortar on boards above freezing.
    b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
    c. Heat both sides of walls under construction using salamanders or other heat sources.
    d. Use windbreaks or enclosures when wind is in excess of 15 mph.
4. 20 Deg F (Minus 7 Deg C) and Below:
    a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F.
    b. Grout: Heat grout materials to 90 deg F to produce in-place grout temperature of 70 deg F at end of workday.
    c. Masonry Units: Heat masonry units so that they are above 20 deg F at time of laying.
    d. Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 deg F for 24 hours after laying units.
5. Do not heat water for mortar and grout to above 160 deg F.

E. Masonry Protection: Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

1. 40 to 32 Deg F (4 to 0 Deg C): Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
2. 32 to 25 Deg F (0 to Minus 4 Deg C): Completely cover masonry with weather-resistive membrane for at least 24 hours.
3. 25 to 20 Deg F (Minus 4 to 7 Deg C): Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
4. 20 Deg F (Minus 7 Deg C) and Below: Except as otherwise indicated, maintain masonry temperature above 32 degrees Fahrenheit for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry, maintain heated enclosure to 40 deg F for 48 hours.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

C. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.06 MASONRY-CELL FILL INSTALLATION

A. Pour insulation materials into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.07 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.08 CONTROL JOINTS

A. General: Install control joint materials in CMUs as masonry progresses. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.

B. Locate control joints. Comply with NCMA TEK 10-02D.

C. Form control joints in CMUs as follows:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control joint gaskets designed to fit standard sash block.

3.09 LINTELS

A. Install lintels over openings as indicated.

B. Provide concrete or formed-in-place masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

C. Install loose steel over openings See Drawings.
   1. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY

A. Placing Reinforcement: Comply with requirements in TMS 402/602.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.

B. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

C. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content.

D. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

E. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at 28 days.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as Work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 08-04A.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including wall caps, coping, lintels, sills, water tables, and thresholds.
   2. Other items indicated on drawings.

1.02 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2025.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

C. Product Data: Test results of cast stone components made previously by the manufacturer.

D. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

E. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Source Quality Control Test Reports.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with a minimum of 5 years of experience in producing cast stone of the types required for project and:
   1. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
   2. Products previously produced by plant and exposed to weather for more than 1 year that exhibit satisfactory appearance.

1.05 MOCK-UP

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. See Section 01 4000 - Quality Requirements for additional requirements.
   1. Approved mock-up will become standard for appearance and workmanship.

2. Mock-up may remain as part of the completed work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Reading Rock, Inc., 4600 Devitt Drive, Cincinnati, Ohio 45246 Phone (800) 482-6466 Fax (513) 874-2361 Web Site: www.readingrock.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: Selected by Architect from manufacturer's full range.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.
      d. Formed outside edges without cuts or miters.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
   1. Pieces More than 12 inches Wide: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Units: Type I, white or gray as required to match Architect 's sample.
   2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Water Repellant admixture.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.

L. Joint Sealant: As specified in Section 07 9005.

M. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

C. Damaged units are not acceptable for installation above grade and should be discarded.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000. Install per best practices of the Cast Stone Institute Technical Manual. www.caststone.org.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
   5. Units to be cut at 90 degree angles only with no miters. Use formed edges at outside corners.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing.
   2. Remove excess mortar from face of stone before pointing joints.
   3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
   4. Leave the following joints open for sealant:
      a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
      b. Joints in projecting units.
      c. Joints between rigidly anchored units, including soffits, panels, and column covers.
      d. Joints below lugged sills and stair treads.
      e. Joints below ledge and relieving angles.

f. Joints labeled "expansion joint".
g. Joints in adjacent masonry such as brick or natural stone.

B. Sealant Joints: Install sealants as specified in Section 07 9005.

C. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at a distance of 5 feet within 10 feet of finish grade, and viewable at a distance of 20 feet away above 10 feet above finish grade.
1. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
2. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Keep cast stone components clean as work progresses.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Structural-steel materials.

B. Shrinkage-resistant grout.

C. Shear stud connectors.

D. Related Requirements:

E. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.

F. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.

1.02 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Heavy Sections: Rolled and built-up sections as follows:

C. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.

D. Welded built-up members with plates thicker than 2 inches.

E. Column base plates thicker than 2 inches.

1.03 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2010.

C. AISC 360 - Specification for Structural Steel Buildings; 2010.

D. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2014.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

J. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

L. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

M. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.

N. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

O. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2014.

P. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2016.

Q. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

R. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

T. AWS D1.8/D1.8M - Structural Welding Code - Seismic Supplement; 2025.

U. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.04 COORDINATION

A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 ACTION SUBMITTALS

A. Product Data:

B. Structural-steel materials.

C. High-strength, bolt-nut-washer assemblies.

D. Shear stud connectors.

E. Anchor rods.

F. Threaded rods.

G. Shrinkage-resistant grout.

H. Shop Drawings: Show fabrication of structural-steel components.

I. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

J. Include embedment Drawings.

K. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

L. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Welding certificates.

C. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

D. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

B. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

D. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

E. Clean and relubricate bolts and nuts that become dry or rusty before use.

F. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

B. ANSI/AISC 303.

C. ANSI/AISC 341.

D. ANSI/AISC 360.

2.02 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. W-Shapes: ASTM A572/A572M, Grade 50.

C. Channels, Angles, M-Shapes: ASTM A572/A572M, Grade 50.

D. Channels, Angles, S-Shapes: ASTM A572/A572M, Grade 50.

E. Plate and Bar: ASTM A572/A572M, Grade 50.

F. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

B. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.04 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

B. Configuration: Straight.

C. Nuts: ASTM A563 heavy- hex carbon steel.

D. Plate Washers: ASTM A36/A36M carbon steel.

E. Washers: ASTM F436, Type 1, hardened carbon steel.

F. Finish: Plain.

G. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

H. Nuts: ASTM A563 heavy- hex carbon steel.

I. Plate Washers: ASTM A36/A36M carbon steel.

J. Washers: ASTM F436, Type 1, hardened carbon steel.

K. Finish: Plain.

L. Threaded Rods: ASTM A36/A36M.

M. Nuts: ASTM A63 heavy- hex carbon steel.

N. Washers: ASTM A36/A36M carbon steel.

O. Finish: Plain.

2.05 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

B. Camber structural-steel members where indicated.

C. Fabricate beams with rolling camber up.

D. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.

E. Mark and match-mark materials for field assembly.

F. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

G. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

H. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

I. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

J. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

K. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

L. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

M. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

N. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

O. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

B. Joint Type: Snug tightened.

C. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

D. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.08 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

B. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

C. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.09 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

B. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

C. Surfaces to be field welded.

D. Surfaces of high-strength bolted, slip-critical connections.

E. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).

F. Galvanized surfaces unless indicated to be painted.

G. Corrosion-resisting (weathering) steel surfaces.

H. Surfaces enclosed in interior construction.

I. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner .

J. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

K. Stripe paint corners, crevices, bolts, welds, and sharp edges.

L. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

B. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

C. Set plates for structural members on wedges, shims, or setting nuts as required.

D. Weld plate washers to top of baseplate.

E. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

F. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

G. Maintain erection tolerances of structural steel within ANSI/AISC 303.

H. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

I. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

J. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

K. Splice members only where indicated.

L. Do not use thermal cutting during erection .

M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

B. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

C. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

D. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.05 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

3.06 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

B. Verify structural-steel materials and inspect steel frame joint details.

C. Verify weld materials and inspect welds.

D. Verify connection materials and inspect high-strength bolted connections.

E. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

F. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

G. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E165/E165M.
      b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

H. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION

SECTION 05 3100
STEEL DECKING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

G. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2008.

H. SDI QA/QC - Standard for Quality Control and Quality Assurance for Installation of Steel Deck; 2022.

1.02 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Composite floor deck.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 035216 "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck.
   3. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
   4. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.03 ACTION SUBMITTALS

A. Product Data:
   1. Roof deck.
   2. Acoustical roof deck.
   3. Composite floor deck.
   4. Electrified cellular floor deck.
   5. Noncomposite form deck.
   6. Noncomposite vented form deck.

B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Sustainable Design Submittals:
   1. Third-Party Certifications: For each product.
   2. Third-Party Certified Life Cycle Assessment: For each product.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Test and Evaluation Reports:
   1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
      a. Power-actuated mechanical fasteners.
      b. Acoustical roof deck.
   2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

D. Field Quality-Control Submittals:
   1. Field quality-control reports.

E. Qualification Statements: For welding personnel.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
   1. AWS D1.1/D1.1M.
   2. AWS D1.3/D1.3M.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.02 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Canam Buildings US Inc.; Canam Group Inc.
   2. New Millennium Building Systems, LLC
   3. Vulcraft Group; Division of Nucor Corp.

B. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
   1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard.
   2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80, G60 zinc coating.
   3. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard.
   4. Deck Profile: As indicated.
   5. Cellular Deck Profile: As indicated, with bottom plate.
   6. Profile Depth: As indicated.
   7. Design Uncoated-Steel Thickness: As indicated.
   8. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.

9. Span Condition: As indicated.
10. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Canam Buildings US Inc.; Canam Group Inc.
   2. New Millennium Building Systems, LLC
   3. Vulcraft Group; Division of Nucor Corp.

B. Fabrication of Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard baked-on, rust-inhibitive primer.
   2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
   3. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard baked-on, rust-inhibitive primer.
   4. Profile Depth: As indicated.
   5. Design Uncoated-Steel Thickness: .
   6. Span Condition: As indicated.

2.04 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.03 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: 5/8 inch, nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated , and as follows:

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

F. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified ???Insert Section number and title???.

3.04 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: 5/8 inch, nominal.
   2. Weld Spacing:
      a. Space and locate welds as indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Electrified Cellular Floor Deck: Install cellular floor system with deck assembled from all-cellular units.
   1. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Section 260539 "Underfloor Raceways for Electrical Systems" with installation of electrified cellular metal floor deck.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
   1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
      a. Field welds will be subject to inspection.
   2. Steel decking will be considered defective if it does not pass tests and inspections.
   3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
      a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
      b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 05 4000
FORMED METAL FRAMING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions; 2012.

C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015.

D. AISI S400 - North American Standard for Seismic Design of Cold-Formed Steel Structural Systems; 2015.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

G. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

I. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

J. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections; 2024.

K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

L. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

M. ASTM E413 - Classification for Rating Sound Insulation; 2022.

N. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2008.

O. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc.; 2013.

1.02 SUMMARY

A. Section Includes:
   1. Load-bearing wall framing.
   2. Vertical deflection clips, exterior.
   3. Vertical deflection clips, interior.
   4. Joist framing.
   5. Roof-rafter framing.
   6. Soffit framing.
   7. Sill sealer gasket/termite barrier.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
   2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
   3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, within height limitations and ceiling-suspension assemblies.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and ASTM C955.

C. Seismic Performance: Cold-formed steel framing to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 and AISI S400???Insert requirement???.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Product iQ" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

E. Sound-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Steel Thickness: As indicated.
   2. Flange Width: As indicated.

B. Steel Track: As indicated.

C. Steel Box or Back-to-Back Headers: As indicated.

2.03 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic-coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Joist hangers and end closures.
   10. Hole-reinforcing plates.
   11. Backer plates.

2.04 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process in accordance with ASTM A123/A123M.

B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards.

2.05 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, in accordance with AISI S240 and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install in accordance with Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, in accordance with Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative errors are not to exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or track to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

E. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom track sized to match studs. Align track accurately and securely anchor at corners and ends, and at spacings as follows:
   1. Anchor Spacing: As indicated.

B. Squarely seat studs against top and bottom track, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.
   1. Fasten both flanges of studs to top and bottom track.
   2. Space studs as follows:
      a. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs in accordance with AISI S240, Section C3.5.2. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
   2. Install track and jack studs above and below wall openings. Anchor track to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated. Fasten at each stud intersection.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
   2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
   3. Bar Bridging: Proprietary bridging bars installed in accordance with manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom track. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.04 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application; 2013.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

F. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

G. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

H. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.

I. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric; 2016.

J. ASTM F2329/F2329M - Standard Speci?cation for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners; 2015 (Reapproved 2023).

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

L. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.02 SUMMARY

A. Section Includes:
   1. Miscellaneous framing and supports.
   2. Shelf angles.
   3. Elevator pit sump covers.
   4. Loose bearing and leveling plates.

B. Related Requirements:
   1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
   2. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.04 ACTION SUBMITTALS

A. Product Data:
   1. Shrinkage-resisting grout.

B. Shop Drawings: Show fabrication and installation details. Provide Shop Drawings for the following:
   1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
   2. Elevator machine beams, hoist beams, and divider beams.
   3. Shelf angles.
   4. Loose steel lintels.

1.05 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Ladders are to withstand the effects of loads and stresses within limits and under conditions specified in ANSI/ASC A14.3.

2.02 FASTENERS

A. General: Unless otherwise indicated, provide stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

E. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

2.03 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.04 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
   1. Provide bearing plates welded to beams where indicated.
   2. Drill or punch girders and plates for field-bolted connections where indicated.
   3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
   1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
   2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

E. Galvanize miscellaneous framing and supports where indicated.

2.06 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

2.07 ELEVATOR PIT SUMP COVERS

A. Fabricate from 3/16 floor plate with four 1-inch- diameter holes for water drainage and for lifting.

B. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than ¾ inches in least dimension.

C. Provide steel angle supports unless otherwise indicated.

2.08 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with zinc-rich primer.

2.09 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.02 INSTALLATION OF ELEVATOR PIT SUMP COVERS

A. Install tops of elevator sump pit cover plates and frames flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.03 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 REPAIRS

A. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
      a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
   2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 REFERENCE STANDARDS

A. AISC 207 - Standard for Certification Programs; 2023.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

D. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Design Data: As required by authorities having jurisdiction.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 207.

F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Dimensions: As indicated on drawings.
   2. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   3. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   4. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.

b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
c. Exposed Edges and Corners: Eased to small uniform radius.
d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.
2. Nosing Depth: Not more than 1-1/2 inch overhang.
3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Galvanized after fabrication, except sheet components to be galvanized before fabrication.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards: Pipe railings as specified in Section 05 5213.

C. Guards:
1. Top Rails: Round pipe or tube rails unless otherwise indicated.
a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
2. Infill at Picket Railings: Vertical pickets.
a. Horizontal Spacing: Maximum 4 inches on center.
b. Material: Solid steel bar.
c. Shape: Square.
d. Top Mounting: Welded to underside of top rail.
e. Bottom Mounting: Welded to top surface of stringer.
3. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
a. Outside Diameter: 1 inch.
b. Material: Steel pipe or tube, round.
c. Vertical Spacing: Maximum 4 inches on center.
d. Jointing: Welded and ground smooth and flush.

4. End and Intermediate Posts: Same material and size as top rails.
    a. Horizontal Spacing: As indicated on drawings.
    b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
    1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
    2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
    1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
    2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
    1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5133
METAL LADDERS

PART 1 GENERAL V-UNDER CONSTRUCTION

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Prefabricated ladders.

1.02 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Designer's Qualification Statement.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

A. Design Ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

2.04 ACCESSORIES:

A. Ladder Up Safety Post:
   1. https://www.bilco.com/productdetail/ladderup%c2%ae-safety-post-48

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative metal units.

B. Railing and Guardrail assemblies

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

E. ASTM B138/B138M - Standard Specification for Manganese Bronze Rod, Bar, and Shapes; 2011 (Reapproved 2024).

F. ASTM B248 - Standard Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar; 2022.

G. ASTM B248M - Standard Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric); 2022.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, anchors, and accessories.

C. Shop Drawings: Indicate elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.

D. Samples for initial selection: for products involving selection of color, texture, or design, including mechanical finishes

E. Test Reports: Submit test reports from independent testing agency showing compliance with specified design and performance requirements.

F. Manufacturer's Instructions: Indicate installation.

G. Installer's qualification statement.

H. Maintenance Data: Manufacturer's instructions for care and cleaning.

I. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications:
   1. Installer specialized in work of type specified with at least three years of documented experience and approved by manufacturer.

C. Templates: Supply installation templates, reinforcing, and required anchorage devices.

1.05 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Mockups: Build mockups to verify slections made under Sample submittals, to demonstrate aesthetic efffects, and to set quality standards for fabrication and installation.
   1. Build mockups for each form and finish railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in factory-provided protective coverings and packaging.

B. Protect materials against damage during transit, delivery, storage, and installation at site.

C. Inspect materials for damage upon delivery. Replace damaged and unrepairable materials. Ensure replacement materials are indistinguishable from undamaged parts and finishes.

D. Prior to installation, store materials and components under cover in a dry location.

1.07 WARRANTY

A. Manufacturer Warranty: Provide 2-year manufacturer warranty for defects in materials, fabrication, finishes, and installation. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 DECORATIVE METAL UNITS

2.02 RAILING AND GUARDRAIL ASSEMBLIES

A. Decorative Metal Railings:
   1. Manufacturer: Julius Blum

2.03 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Steel Components:
   1. Sections, Shapes, Plate and Bar: ASTM A36/A36M.
   2. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
      a. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
      b. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
   3. Iron Castings: ASTM A47/A47M, malleable.
   4. Sheet Thickness: 11 gauge, 0.120 inch.
   5. Welding Materials: Comply with AWS D1.1/D1.1M.

C. Bronze Components: ASTM B138/B138M.
   1. Concealed: Alloy 280 muntz metal; color similar to alloy 385.
   2. Exposed: Architectural extruded bronze; color similar to alloy 280.
   3. Sheet Thickness: 12 gauge, 0.081 inch.

D. Brass Components:
   1. Sheet: ASTM B248 or ASTM B248M, No.26 Yellow Brass.
   2. Sheet Thickness: 12 gauge, 0.081 inch.

2.04 FABRICATION

A. Fit and shop assemble items in largest practical sections for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less tha that required to support structural loads.

F. Shop assemble railings to greatest extend possible to minimize field splicing and assembly. Diassemble units only as necessary for shipping and handling limitations.

G. Welded Connections: Cope components at connections to provide close fit, or use fitting designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develope strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation from Plane: 1/16 inch in 48 inches.

2.06 FINISHES

A. General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions, and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.

B. Brass Finish: US3 - Bright Brass.
   1. Protective Coating: Lemon oil seal.

C. Steel Finishes:
   1. Baked-Enamel Finish: Manufacturer's standard two-coat baked-enamel finish; topcoat minimum dry film thickness of 1 mil, 0.01 inch. Total minimum dry film thickness of 2 mils, 0.02 inch.
   2. Color: As selected by Architect from manufacturer's standard range.

2.07 ACCESSORIES

A. Anchors and Fasteners: Provide anchors, fasteners, and other attachment devices required to attach to structure. Ensure attachment devices are of same material as components unless indicated otherwise.
   1. Exposed Fasteners: Not allowed.

2.08 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Arkansas to design railings, including attachment to building construction.

B. Structural Performance: Railings, include attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Unifoprm load of 50lb/ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions have been corrected.

3.02 PREPARATION

A. Protect existing work.

B. Clean surfaces to receive units. Remove materials and substances detrimental to installation.

3.03 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove protective film from exposed metal surfaces.

C. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage the material or finish.

3.05 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.

C. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Roof-mounted curbs.

B. Roofing nailers.

C. Preservative treated wood materials.

D. Fire retardant treated wood materials.

E. Communications and electrical room mounting boards.

F. Concealed wood blocking, nailers, and supports.

G. Wall sheathing with factory applied water-resistive and air barrier sheet.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.

E. PS 1 - Structural Plywood; 2009.

F. PS 20 - American Softwood Lumber Standard; 2025.

G. SPIB (GR) - Standard Grading Rules; 2021.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on structural lumber, sheathing, fire treated and wood preservative materials and application instructions.

C. Installation fastener requirements and spacing.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with and requirements of grading agencies.
   1. Species: _____, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc;

B. Sizes: Nominal sizes as indicated on drawings, _____.

C. Moisture Content: as indicated on drawings..

D. Stud Framing:
   1. Species: _____.
   2. Grade: as indicated on drawings..

E. Joist, Rafter, and Small Beam Framing:
   1. Grade: as indicated on drawings.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Board.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Plywood, PS 1 5/8" APA Rated Plywood
   1. Reference Structural Drawings

B. Wall Sheathing at backside of parapets : Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
   1. To be used ast backside of parapets at locations where single-ply roofing membranes are installed. Coordinate with roofing manufacturer requirements.
   2. Manufacturers:
      a. Georgia-Pacific Gypsum; DensDeck Prime: www.gpgypsum.com/#sle.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

D. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors: Use fasteners suitable for proper attachment to substrates and contain weatherized coating approved for use where exposed. Fasteners in treated lumber are required to have high corrosion resistance, compatible with chemical treatment and be approved for use by wood manufacturer.
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Sill Flashing: As specified in Section 07 6200.

C. Water-Resistive Barrier: For other locations, as specified in Section 07 2500.

D. Fluid Applied Weather Barrier Joint Treatment: Dens Defy Liquid Flashing.

E. Joint Transition Membane: Dens Defy Transition Membrane.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood (FRTW) : Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood (PTW): Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use fire treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
      c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. At building construction types I & type II, refer to code review statements on drawings, use fire-retardant treated wood FRTW where drawings indicate the use of wood for blocking, nailers or furring at the following locations:
   1. Exterior walls that are classified with fire resistance rating.
   2. Interior fire resistance rated partitions.

C. At exterior walls, use pressure treated wood PTW for blocking.

D. At interior locations, blocking shall be standard wood unless noted otherwise.

E. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

F. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

G. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Locations of termination bars for elements such as masonry flashing or roofing, etc.. Continuous plywood strips are permitted at exterior walls, in same thickness of wall sheathing, provided the exterior surface is field treated with fluid weather barrier product.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing, using nails, screws, or staples.
   1. Use fastener type and spacing as recommended by manufacturer to accommodate no less than structural design wind speed per structural plans.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

C. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs as recommended by manufacturer.
   1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
   2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
   3. Use compatible fluid applied weather barrier at transitions to adjacent materials.
   4. Apply manufacturer's standard seam tape to joints between sheathing panels. Use tape gun or hard rubber roller as recommended by manufacturer.
   5. Treatment of openings, penetrations, patches and repairs are per section 07 2500 weather barriers.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1600
SHEATHING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2011.

B. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

D. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc.; 2013.

1.02 SUMMARY

A. Section Includes:
   1. Roof sheathing.
   2. Subflooring and underlayment.
   3. Sheathing joint-and-penetration treatment materials.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for plywood backing panels.
   2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 ROOF SHEATHING

A. Plywood Sheathing, Roofs: , Exposure 1, Structural I sheathing.
   1. Span Rating:As indicated. .
   2. Nominal Thickness:As indicated .

2.02 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: , Exposure 1, Structural I single-floor panels or sheathing.
   1. Span Rating:As indicated. .
   2. Nominal Thickness:As indicated. .

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
   1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours in accordance with ASTM B117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
      b. Screw to cold-formed metal framing.
      c. Space panels 1/8 inch apart at edges and ends.

3.03 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Air barriers will be considered defective if they do not pass tests and inspections.

C. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 06 1715
ENGINEERED STRUCTURAL WOOD

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. APA PRR 410 - Standard for Performance-Rated Engineered Wood Rim Boards; 2021.

B. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series); 2010.

C. ASME B18.6.1 - Wood Screws (Inch Series); 1981 (Reaffirmed 2016).

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

E. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.

F. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products; 2021, with Editorial Revision.

G. ASTM D7672 - Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies; 2024.

H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2024.

I. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2024.

J. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products; 2011.

K. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

L. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc.; 2013.

1.02 SUMMARY

A. Section Includes:
   1. Structural composite lumber.
   2. Engineered rim boards.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for dimension lumber items associated with engineered structural wood.

1.03 INFORMATIONAL SUBMITTALS

A. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store, stack, and handle engineered wood products to comply with recommendations of APA EWS E705.
   1. Store wrapped or banded together until ready for installation, on level well-drained area. Do not store in direct contact with the ground. Use stickers to separate bundles, spaced as recommended in writing by manufacturer.
   2. Store I-joists level with the webs vertically.

B. Do not stack other material on top of structural composite lumber or I-joists.

PART 2 PRODUCTS

2.01 SOURCE LIMITATIONS

A. Obtain each type of engineered wood product from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

2.03 STRUCTURAL COMPOSITE LUMBER

A. Laminated-Veneer Lumber (LVL): Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored in accordance with ASTM D5456, and manufactured with exterior-type adhesive complying with ASTM D2559.
   1. Allowable Stresses:
      a. Modulus of Elasticity, Edgewise (E): 2,000,000 psi.
   2. Moisture Protection: Factory seal face, edge and ends with manufacturer's standard water-resistant coating.

2.04 ENGINEERED RIM BOARDS

A. Prefabricated, structural fire-resistant panel complying with APA PRR 410, APA PRR 401, or ASTM D7672 for wood frame construction and research or evaluation report for I-joists.
   1. Manufacturer: Provide products by same manufacturer as I-joists.
   2. Material: LVL.
   3. Thickness: 1-1/4 inches.
   4. Identification Marks: Comply with APA PRR-401, rim board grade.
      a. Factory mark rim board with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.
      b. Factory mark rim boards with manufacturer's name, rim board series, mill identification, manufacturing date and time, name of third-party inspection agency, and ICC/CCMC code report number. Repeat identification marks at minimum 12 feet intervals.

2.05 FASTENERS

A. General: Fasteners are to be of size and type indicated and to comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

G. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that joist flange widths match hanger widths.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Do not install in direct contact with concrete or masonry.

B. Where wood-preservative-treated members are installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use treatment approved in writing by manufacturer.

3.03 INSTALLATION OF STRUCTURAL COMPOSITE LUMBER

A. Install to comply with ESR report, manufacturer's written instructions, and applicable code.
   1. Install in dry, covered conditions where average in-service moisture content of lumber is 16 percent or less.
   2. Install metal framing connections in accordance with AWC's "National Design Specification (NDS) for Wood Construction." Install fasteners through each fastener hole.
      a. Connections based on NDS or manufacturer's test or code reports.
   3. Install lumber plumb and level. Accurately fit, align, securely fasten, and install free from distortion or defects.
   4. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

B. Cutting: Confirm size and location of field cutting, notching, and drilling with ESR report, registered design professional, and manufacturer.

3.04 INSTALLATION OF PREFABRICATED WOOD I-JOISTS

A. Install to comply with ESR report, manufacturer's written instructions, and applicable code.
   1. Install in dry, covered conditions where in-service moisture content of wood does not exceed 16 percent.
   2. Install metal framing connections in accordance with AWC's "National Design Specification (NDS) for Wood Construction." Install fasteners through each fastener hole.
   3. Install joists with top and bottom flanges within 1/2 inch of true vertical alignment, and support ends of each member with not less than 1-3/4 inches for end bearing and 3-1/2 inches for intermediate bearings.
   4. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
   5. Provide lateral restraint at supports to prevent rotation, and along the compression flange of each joist.
   6. Completely install and properly nail hangers, rim joists, rim boards, blocking panels, and x-bracing as each joist is set.

B. Cutting: Do not splice structural members between supports unless otherwise indicated.
   1. Do not cut, drill, or notch I-joist top and bottom flanges except for cutting to length.

3.05 INSTALLATION OF ENGINEERED RIM BOARDS

A. Install at bearing walls perpendicular to and supported by I-joists that require full-depth blocking, or rim joists, at supports.

B. Sill Sealer Gasket: Install to form continuous seal between sill plates and foundation walls.

3.06 PROTECTION

A. Protect wood that has been treated with SBX from weather. If, despite protection, SBX-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Stairs, doors, cased openings, fireplace mantels and breast, living room built-in shelving

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2009.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of finish plywood, 8x8 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.06 MOCK-UP

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Architectural Woodwork, General:
   1. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
      a. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: premium grade closed grain hardwood (poplar); prepare for paint finish.
   2. Door, Glazed Light, and Pocket Door Frames: premium grade closed grain hardwood (poplar); prepare for paint finish.
   3. Window Sills: Clear fir; prepare for painted finish.
   4. Stairs, Balustrades, and Handrails: Clear fir; prepare for stained finish.
      a. Risers: Poplar plywood for paint finish
      b. Treads: White oak tread for stain
      c. Mahagony cap rail for stain
      d. Stairs, doors, cased openings, fireplace mantels and breast, living room built-in shelving.
      e. Ornamental Stringer - Closed cell hardwood for paint
   5. Loose Shelving: Birch plywood; prepare for paint finish.

2.02 WOOD-BASED COMPONENTS

A. Provide sustainably harvested wood, certified or labeled as specified in Section 01 6000 - Product Requirements.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: _____ species, _____ sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

C. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish; ____ manufactured by ____.
   1. PL-XX

B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate; _____ manufactured by _____.

C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.07 ACCESSORIES

A. Lumber for Shimming, Blocking, and other concealed spaces: Softwood lumber of Southern Pine species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.08 HARDWARE

A. Hardware: Cabinet pulls: Merit Arlington - 10068 - 1" Diameter - Finish Brunished Brass-Wax (BURB).

2.09 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with aluminum trim.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

F. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

G. Shop prime and back prime.

2.10 SHOP PRIMING

A. Prepatations for Finishing: Comply with Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work

B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer
   1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.11 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 5, Varnish, Conversion.
      b. Stain: As selected by Architect.
      c. Sheen: as selected by architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install interior grade architectural woodwork to comply with same grade as item to be installed

B. Standing and Running Trim
   1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible
   2. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary
   3. Scarft running joints and stagger in adjacent and related members
   4. Fill gaps, if any between top of base and wall with latex sealant, painted to match wall
   5. Install standing adn running trim with no more variation from a straight line than 1/8" inch in 96 inches

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

E. Install hardware in accordance with manufacturer's written instructions.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9113 and 09 9123.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100
ARCHITECTURAL WOOD MILLWORK

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Custom made specially fabricated cabinet units and assemblies.

B. Countertops.

C. Hardware.

1.02 REFERENCE STANDARDS

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

B. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   3. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs. Provide documentation that millwork meets or exceeds quality standard specified.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Quality Certification:
   1. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 MOCK-UP

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CABINETS

A. Quality Standard: Paint-grade in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets and Shleves: Custom grade.
   1. Finish - Exposed Exterior Surfaces: HPL veneer.
   2. Finish - Exposed Interior Surfaces: HPL veneer.
   3. Finish - Semi-Exposed Interior Surfaces: White melamin, unless noted otherwise.
   4. Finish - Concealed Surfaces: Manufacturer's Standard.

C. Paint-Grade Solid Wood Cabinets and She :
   1. Finish - Exposed Exterior Surfaces: Paint-grade wood primed / painted.
   2. Finish - Exposed Interior Surfaces: Paint-grade wood primed / painted.
   3. Finish - Semi-Exposed Surfaces: Paint-grade wood primed / painted.
   4. Finish - Concealed Surfaces: Manufacturer's option.
   5. Door and Drawer Front Edge Profiles: As indicated on drawings.
   6. Interface Style for Cabinet and Door: As indicated on drawings.
   7. Cabinet Design: As indicated on drawings.
   8. Adjustable Shelf Loading: 50 lbs. per sq. ft.
   9. Cabinet Style: As indicated on drawings.
   10. Cabinet Doors and Drawer Fronts: As indicated on drawings.
   11. Drawer Side Construction: Multiple-dovetailed.
   12. Drawer Construction Technique: Dovetail joints.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.04 PLASTIC LAMINATE MATERIALS

A. Manufacturers:
   1. As indicated on drawings.

B. High Pressure Laminate (HPL): NEMA LD 3, types as recommended for specific applications.
   1. Products: As indicated on drawings.

C. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, finish as indicated on drawings.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, finish as indicated on drawings.
   3. Cabinet Liner: CLS, 0.020 inch nominal thickness, finish as indicated on drawings.
   4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure laminate.

2.05 COUNTERTOPS & SILL SURFACES

A. Solid Surfacing: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Products: As indicated on drawings.
   2. Flat Sheet thickness: 1/4" minimum.
   3. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-pourous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
   4. Other component thicknesses: 1/2 inch minimum.
   5. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
   6. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   7. Integral solid surface sinks:

a. Wilsonart BV1612ADA or Corian 810.

B. Quartz Surfacing: Quartz slabs bonded to substrate; use as large pieces as possible with inconspicuous adhesive joints.
   1. Products: As indicated on drawings.
   2. Uniform surface without cracks, void or pin holes.
   3. Stone Thickness: 3/4 inch (2cm) minimum.
   4. Surface Finish: Polished
   5. Exposed Edge Treatment: Square profile stone, 1 inch thick with 1/8 inch radius corner.
   6. Back and End Splashes: Same material; 3/4 inch (2cm) thickness; for field attachment.
   7. Fabricate in accordance with AWI/AWMAC/WI (AWS) Standards, Section 11- Premium Grade.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.07 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Shelf standards and Rests: Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drileld holes and to prevent accidental rotation of support. The support automatically adapts to 19mm (3/4") or 25mm (1") thick shelving and provides a non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pound per support) without failure.

C. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome or satin chrome finish, for nominal 1 inch spacing adjustments.

D. Concealed Floating Shelf Brackets:
   1. Material: Steel
   2. Finish/Color: Black powdercoat
   3. Size: Length as required per shelf width. See drawings.
   4. Manufacturers:
      a. [Right On Bracket; rightonbracket.com].
      b. Substitutions: See Section01 6000-Product Requirements
      c. Substitutions: See Section01 6000-Product Requirements

E. Concealed Countertop 'L' Bracket:
   1. Material: Steel
   2. Finish/Color: White powdercoat.
   3. Manufacturers:
      a. Iron Supports; WWW.IRONSUPPORTS.COM.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Drawer and Door Pulls:
   1. HW-1
      a. Basis of Design: Top Knobs Ormonde 6-5/16 Inch Center to Center Bar Cabinet Pull
      b. Model: TK3123HB

c. Finish: Honey Bronze
2. HW-2
a. Basis of Design: Top Knobs Ormonde 18 Inch Center to Center Bar Cabinet Pull
b. Finish: Honey Bronze
3. HW-3
a. Basis of Design: Amerock Coble 6-5/16 Inch Center to Center Smooth Handle Cabinet Pull
b. Model: Amerock BP37664
c. Finish: Polished Chrome
4. HW-4
a. Basis of Design: Amerock Versa 1-3/8 Inch Mushroom Cabinet Knob
b. Model: Amerock BP36904
c. Finish: Polished Chrome

G. Drawer Slides:
1. Type: Full extension.
2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed and soft close type.
6. Manufacturers:
a. Accuride International, Inc; Light-Duty Drawer Slides: www.accuride.com/#sle.
b. Grass America Inc; Ball Bearing Slide System: www.grassusa.com/#sle.
c. Knape & Vogt Manufacturing Company; Medium-Duty Drawer Slides: www.knapeandvogt.com/#sle.

H. Hinges: European style concealed self-closing type, steel with polished finish.
1. Manufacturers:
a. Grass America Inc; Tiomos Hinge System: www.grassusa.com/#sle.
b. Blum, Inc: www.blum.com/#sle.

I. Soft Close Adapter: Concealed, frame-mounted, screw-adjustable damper ; steel with satin finish.
1. Manufacturers:
a. Grass America Inc; Unisoft: www.grassusa.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.
c. Locations: All cabinet doors and drawers throughout.

J. Cabinet Pocket Door Slides:
1. Class: Heavy-duty.
2. Bracket: Surface-mounted.
3. Slide: Manufacturer's standard steel ball-bearings.
4. Manufacturers:
a. Knape & Vogot Manufacturing Company; 80XX Series Pocket Door Slides; www.knapeandvogt.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

E. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
   1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

F. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. System - 10, UV Curable, Water-based.
      b. Color: As indicated on drawings.
      c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe millwork abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean millwork, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 4200
WOOD PANELING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Custom wood veneer paneling and trim.

B. Solid wood panel trim.

C. Shop finishing.

1.02 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fire retardant treatment materials and application instructions.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories. Inidicate joints of panels for approval.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide plan of panel number sequencing and veneer matching.
   3. Indicate elevations, profiles, sections, quality, and views of panelwork.
   4. Show sizes, thicknesses, quantities, markings, materials, wood species, finishes, accessories, hardware, and locations of each item.
   5. Include assembly and installation drawings to show methods of wood blocking, fastening, bracing, jointing, and connecting to work of other trades.
   6. Indicate dimensions necessary for fitting panelwork and appliances to fixed walls. Be responsible for deatials and dimensions not controlled by Project conditions. \
   7. Indicate cut-out locations, plumbing fixtures, mechanical and electrical devices, and other items occurring in panelwork.
   8. Indicate grain direction for solid lumber and veneer. Show flitch layout for veneers.

D. Samples: Submit two samples of finished plywood, 6 x 6 inch in size, illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim, 6 inch long.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company certified by Woodwork Institute.
   2. Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   3. Capacity to lay up veneers.

B. Single Source Responsibility:
   1. Obtain architectural panelwork from single source to ensure uniformity in quality, appearance, and construction.
   2. Fabricator is responsible for finishing and installation of panelwork.
   3. Provide panel core, fire retardant treatment, adhesives, veneers, finishes, fabrication processes, storage, handling, building conditioning, and similar items that are compatiable with one another to prevent product failures such as veneer delamination, checking, cracking, blisters, glue bleedthrough, or discoloration of veneers

C. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   3. Certification by treating plant indicating type of chemicals used and fire performance characteristics achieved. Certify treatment will not have adverse affect on finish.

D. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   5. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   6. All fees charged by the Woodwork Institute for their Certified Compliance program are responsibility of millwork manufacturer and/or installer and shall be included in their bid.

1.05 MOCK-UP

A. Construct mock-up, 4 feet long by 4 feet wide, illustrating full panel sheet, edge trim, joint trim, applied finish and other details.

B. Locate where directed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Field Measurements:
   1. Field measure conditions where panelwork is indicated to be fitted to other construction prior to fabricating work of this Section.
   2. Show final field measurements on shop drawings.
   3. Where field measurements cannot be made without delaying Project, coordinate dimensions among trades to ensure proper fit of panelwork.

PART 2 PRODUCTS

2.01 PANELING

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Flat Paneling: Basis of Design;
   1. Species: Douglas Fir South (DFS) Grade AA.
   2. Cut: Quarter Slice, grain run vertically.
   3. Panels: Veneer of full width and balanced sequence matched.
      a. Panels More Than One Leaf High: Architectural end matching.
   4. Visible Edges and Reveals: Edgebanded with matching trim.
   5. Outside Corners: As indicated on the Drawings.

2.02 WOOD-BASED MATERIALS - GENERAL

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood Plywood: HPVA HP-1 Grade A; veneer core, type of glue recommended for application; of grain quality suitable for transparent finish.

C. Particleboard: Complying with ANSI A208.1; composed of wood chips, medium density, made with waterproof resin binders; of grade to suit application; sanded faces, ***Fire Retardant Pressure Treated.***

1. Fire Retardant Pressure Treated Description:
    a. Ensure not required to have brush treatment of cuts made in the field.
    b. Ensure not capable of bleed through or adversly affecting type of finish indicated.
    c. Ensure not capable of corroding metals when tested in accordance with MIL-L-19140E.
    d. Acceptable Products and manfacturers: D-Blaze, Chemical Specialties Inc.; Dricon, Hickson Corporation; Pyroguard, Hoover Treated wood products.

D. Lumber: Maximum moisture content of 6 percent; with vertical grain , of quality suitable for transparent finish.

2.03 ADHESIVES AND FASTENERS

A. Adhesives: Type suitable for intended purpose, complying with applicable air quality regulations.

B. Panel Clips Fasteners: Monarch Metal Fabrication: www.monarchmetal.com

1. MF375 2" Clip attached to panels & Continous Lengths attached to wall.. Minimum 3 Rows of Clips per Panel. Minimum 4 Clips per Row. Space Per Manufacturer's recommendation.

C. Fasteners in contact with aluminum trim to be aluminum or metal that will not cause galvanic action.

D. Where multiple layers occur, use glue and fasten to substrate.

2.04 ACCESSORIES

A. Edgebanding: Pre-glued and non pre-glued .6 mm to all exposed sides of panels.

B. Solid stock wood trim: Premium Grade Douglas Fir, Quarter Sawn, Vertical grain.

C. Lumber for Shimming, Blocking : Softwood lumber of Southern Yellow Pine species.

D. Primer: Alkyd primer sealer type.

E. Wood Filler: Tinted to match surface finish color.

F. Correction pens and lacquer pen: In colors to match selected surface.

2.05 FABRICATION

A. Shop prepare and identify panels for grain matching during site erection.

B. Prime concealed and semi-concealed surfaces with sealer. Brush apply only.

C. Route or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.

D. Prepare panels for delivery to site, permitting passage through building openings.

E. Finish exposed edges of panels as specified by grade requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. General:
   1. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
   2. Distribute defects allowed in quality grade to best overall advantage when installing Project assembled panelwork items.
   3. Shim as required using concealed shims.
   4. Provide uniformly spaced reveals.
   5. Before making cutouts, drill pilot holes at corners.
   6. Tolerances for Field Assemblies/Joined Items:
      a. Maximum Variation from True Position: 1/16 inch unless otherwise specified or required by AWS grade.
      b. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch unless otherwise specified or required by AWI grade.

B. Field Fitting:
   1. Cut to fit and carefully scribe.
   2. Where work abuts other finished surfaces, scribe and cut for accurate fit.
   3. Do not use overlay trim pieces to cover joints.

C. Paneling:
   1. Set and secure horizontal grounds across substrate, rigid, plumb, and square.
   2. Shim with concealed shims to ensure straight, flush, plumb and level panel installation.
   3. Install panels in sequence using full width panels in field and adjusting.
   4. Attachment:
      a. Provide fabricator's standard concealed fasteners.
      b. Provide for thermal and building movements.
      c. Blind nail where possible. Use finishing nails where exposed nails are required, set nail heads, and fill.
      d. Provide bolts with blind fasteners at fabricator's recommended spacing
      e. Provide concealed panel hanger clips mounting of panels to grounds.
      f. Where multiple layers are used, glue and fasten to the substrate.
      g. No exposed fasteners are permitted.
      h. Architecturally integrate light fixtures recessed in wood panels to be coordinated with electrical and architectural drawings.

3.03 ACCESSORIES

A. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

B. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

3.04 PREPARATION FOR FIELD FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Field Finishing: Refer to Section 09 9123.

3.05 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 6500
CELLULAR PVC TRIM AND COLUMNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Free-Foam Cellular PVC Trim Boards for:
   1. Composite Entablature
   2. Composite Header Panel
   3. Composite Quoin Corner Panels
   4. Composite Pilasters
   5. Composite Sills and Panels
   6. Freestanding Columns
   7. Composite Beadboard

1.02 REFERENCES

A. ASTM D 792 - Density and Specific Gravity of Plastics by Displacement.

B. ASTM D 570 - Water Absorption of Plastics.

C. ASTM D 638 - Tensile Properties of Plastics.

D. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D 1761 - Mechanical Fasteners in Wood.

F. ASTM D 5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.

G. ASTM D 256 - Determining the Pendulum Impact Resistance of Plastics.

H. ASTM D 696 - Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and plus 30 degrees C with a Vitreous Silica Dilatometer.

I. ASTM D 635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

J. ASTM E 84 - Surface Burning Characteristics of Building Materials.

K. ASTM D 648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

L. ASTM D 3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

M. ASTM D 2240 - Rubber Property - Durometer Hardness

N. ASTM D 3345 - Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of 5 years producing PVC trim products.

B. Installer Qualifications: Installer with a minimum of 3 years experience with the installation of PVC trim products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.
   4. Accepted mock-ups shall be comparison standard for remaining Work

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.

B. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.06 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. Provide manufacturer's transferable limited lifetime warranty against defects in manufacturing that causes the products to rot, corrode, delaminate, or excessively swell from moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Decoro Building Products https://decoro.com/

B. Requests for substitutions will be considered in accordance with provisions of Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Material: Free Foam Cellular PVC material with a small-cell microstructure and density of .55 - .60 grams/cm³. 1. Material shall have a minimum physical and performance properțes specified in the following Secțon B.

B. Performance and physical characteristic requirements:

2.03 ACCESSORY PRODUCTS

A. FASTENERS:
   1. Use stainless steel fasteners designed for wood trim and siding for best results. Fastener should have suȘcient flexural and tensile strength to resist bending
   2. Fasteners with thin shanks, blunt points, and full round heads are preferred. The fastener must be long enough to penetrate the substrate a minimum of 2/1 1 inches. •
   3. Do not use staples, small brads and wire nails. Avoid using finethreaded wood screws and ringshank fasteners. •
   4. Use standard nail guns with a pressure seȝng between 70 psi and 100 psi. The recommended pressure depends on the type of gun, type of nail, ambient temperature, and the substrate. Care should be taken not to overdrive the nail into the material. •
   5. Pre-drilling typically is not required unless large fasteners are used or the product is installed during low temperatures. •

6. Use two fasteners for every framing member for trimboard applicaṭons. Sheets and trimboards 8 inches and wider require addiṭonal fasteners. •
7. Install fasteners no more than 2 inches from the end of each board. •
8. Avoid fastening PVC trim board over hollow or uneven areas. Fasten PVC trim onto flat, solid substrates. •
9. 8/3” and 2/1” thick PVC sheets and bead boards are not designed to be ripped and used for trim applications. These products must be glued and mechanically fastened to the substrate.

B. ADHESIVES:
1. All bonded surfaces must be smooth, clean, and in complete contact with each other for best results. •
2. For adhering PVC trim board to itself, bond joints with PVC cement or cellular PVC adhesives to prevent joint separation. Products such as Bond-and-Fill (2 component epoxy), IPS Weld-On 705 (white), and Genova Vinyl Adhesive are excellent cements. •
3. Remember that most PVC cements cure quickly (5-3 minutes), and have a limited working time •
4. Scarf cut joints are recommended. •
5. Bonded joints should be secured with fasteners and fastened on each side of the joint. •
6. When bonding PVC trim board to other substrates, consult the adhesive manufacturer to determine suitability.
7. If you have to butt joints, double nail the trim boards on both sides of the butt joint and reinforce with construction adhesive applied to the backside of the trim boards.

C. SEALANTS
1. Use urethane, polyurethane, polymer blends or acrylic based sealants that do not contain silicone.

2.04 FINISHES

A. PREPARATION:
1. Be sure the PVC trim board surface to be painted is clean, dry, and free of dirt, loose or peeling paint, mildew, chalk, grease and any other surface contaminants before paint application. •
2. Use %100 acrylic latex or %100 acrylic latex with urethane additive paint with a light reflective value equal to or greater than 55 units.
3. Follow the paint manufacturer’s application recommendations.
4. Nail holes may be finished with a two component methacrylate, poly urethane, polymer, or acrylic based caulk, or painted over. Use a caulk that is UV resistant

2.05 INSTALLATION

A. Manufacturer’s instructions: Comply with manufacturer’s installation instructions and product technical bulletins.

B. CUTTING
1. PVC trim board can be cut using standard woodworking saws. Conventional carbide-tipped blades designed for cutting wood are preferred. Avoid using fine-tooth metal-cutting blades.
2. • Rough-cut edges are typically caused by excessive friction, poor board support, or worn or improper tooling. B.

C. DRILLING:
1. PVC trimboard can be drilled using standard woodworking drill bits. Do not use drill bits made for rigid PVC. •
2. Avoid frictional heat build-up. •
3. Remove shavings periodically from a drill hole as necessary.

D. ROUTING:

1. PVC trim board can be routed using standard woodworking router bits. Carbide-tipped router bits are preferred. •
2. Routing PVC trimboard provides a crisp, clean edge due to PVC trim board's consistent density.

E. MILLIING & MOULDING:
1. PVC trim board can be milled or moulded using standard milling or molding machines found in millwork shops.
2. Rake angle 20 to 30 degrees. 25 degrees appears to work the best. •
3. Cutting speed to be optimized with the number of knives and feed rate.

F. ROUTING:
1. PVC trimboard can be routed with virtually any piece of equipment used to rout wood. •
2. Carbide tipped router bits are recommended. •
3. Machinery that allows for multiple cuttng speeds will allow you to optimize the process obtaining a smoother finished part.

G. EDGE FINISHING:
1. Traditional sanding, grinding or filing tools used for woodworking are preferred.

H. NAIL LOCATION:
1. For trimboard applications, use 2 fasteners per framing member. •
2. Additional fasteners are required for trimboard 8" and wider. •
3. Fasteners must be installed a maximum of 2" from the end of each board.

I. EXPANSION AND CONTRACTION:
1. PVC trimboard expands and contracts with changes in temperature. Properly fastening PVC trimboard along its entre length will minimize expansion and contraction.
2. Allow -16/3inch space per -18 foot run of PVC trimboard for expansion and contraction.
3. Bond joints between pieces of PVC trimboard to eliminate separation.
4. Allow expansion and contraction space at the ends of long runs.

J. CLEANING:
1. PVC trimboard can be cleaned with mild detergent and water. Products with pumice, such as Soș Scrub® with Bleach, may be applied with an abrasive nylon brush. For more stubborn stains use a mild household cleaner and degreaser like Clorox® Cleanup or Clorox® Outdoors.

2.06 SIMULATED WOOD TRIM

1. Composite Entablature
   a. Custom shape. See drawings.
2. Composite Header Panel
   a. Custom shape. See drawings.
3. Composite Quoin Corner Panels
   a. Custom shape. See drawings.
4. Composite Pilasters
   a. Custom shape. See drawings.
5. Composite Sills and Panels
   a. Custom shape. See drawings.
6. Freestanding Columns
   a. See drawings.

END OF SECTION

SECTION 06 7300
COMPOSITE DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic composite decking.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Composite Materials: Materials made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce materials with characteristics different from the individual components.

B. Plastic Composites, or Wood-Plastic Composites: Composite materials made primarily from wood- or cellulose-based materials and plastics.

1.04 REFERENCE STANDARDS

A. ACMA (FRP) - Guidelines and Recommended Practices for Fiber-Reinforced-Polymer (FRP) Architectural Products; 2016.

B. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.

C. ANSI/ACMA/PIC (CSP) - Code of Standard Practice, Industry Guidelines for Fabrication and Installation of Pultruded FRP Structures; 2011 (Reapproved 2012).

D. ASCE/ACMA (PS) - ASCE/ACMA Pre-Standard for Load & Resistance Design (LRFD) of Pultruded (FRP) Structures; 2010.

E. ASTM D7032 - Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails; 2021.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published product literature:
   1. Include sizes and profiles; structural design data.

C. Shop Drawings - Plastic Composite Decking: For each system; indicate:
   1. Plans and Sections: Include column centers, elevations, and dimensions, indicating locations of members and connections.

D. Samples: Submit two samples, 12 inches by 12 inches in size, indicating specified texture and finish.

E. Delegated Design Documents: Drawings and calculations sealed by Designer.
   1. Sufficient to demonstrate compliance with ASCE/ACMA (PS) and applicable building code; signed sealed by Engineer of Record for design of FRP composite decking systems.

F. Designer's qualification statement.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of Professional Structural Engineer experienced in design of this type of work and licensed in the State of Arkansas.

1.07 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Construct decking mock-up, _____ feet long by _____ feet wide, demonstrating aesthetic effects and workmanship.

C. Locate where directed.

D. Mock-ups may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unbroken packages, or bundles bearing label of manufacturer and component identification markings.

B. Store materials under cover and elevated above grade.

C. Package and label adhesives separately; store in dry, indoor facility.

D. Store adhesives at minimum ambient temperature of 70 degrees F and maximum 85 degrees F, in ventilated area, and as required by manufacturer's instructions.

E. Protect decking units from damage including cracking or chipping.

1.09 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's standard limited warranty for products. Complete forms in Owner's name and register with manufacturer.

C. Manufacturer Special Warranty: Provide 25-year manufacturer warranty against splintering, splitting, rot, and decay. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 PLASTIC COMPOSITE DECKING

A. Manufacturers:
   1. AZEK Building Products, Inc; TimberTech AZEK Harvest Collection: www.azek.com/#sle.
   2. Deckorators, Inc; Voyage Composite Decking: www.deckorators.com/#sle.
   3. DuxxBak Composite Decking: www.duxxbakdecking.com/#sle.
   4. MoistureShield, an Oldcastle APG brand; MoistureShield Elevate: www.moistureshield.com/#sle.
   5. NewTechWood; US01 - Magellan: www.newtechwood.com/#sle.
   6. Trex Company, Inc; ____: www.trex.com/#sle.
   7. Wolf Home Products: www.wolfhomeproducts.com.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Plastic Composite Decking: Extruded thermoplastic composite decking boards; for exterior applications where ICC (IBC) permits combustible construction; complying with ASTM D7032.
   1. Shell: Fully enclosed.
   2. Filler: Inorganic
   3. Deck Board Size: 7/8 inch by 3-1/8 inches.
   4. Board Edges: Radiused.
   5. Board Side Profile: Slotted.
   6. Deck Board Slip Resistance - Dynamic Coefficient of Friction (DCOF) (Wet): Minimum of 0.42, when tested in accordance with ANSI A326.3.
   7. Finish: Manufacturer's standard finish; in compliance with specified slip resistance requirements.
   8. Color: To be selected by Architect from manufacturer's full range.
   9. Color: As indicated on drawings.

C. Accessories:
   1. Manufacturer's standard fasteners and anchorage devices.

2.02 ACCESSORIES:

A. Manufacturer's standard fasteners and anchorage devices.

PART 3 EXECUTION

3.01 EXAMINATION - GENERAL

A. Verify dimensions, tolerances, and interfaces with related work; verify location of supporting assemblies.

B. Examine field conditions to confirm that building lines, grades, and elevations will allow proper installation of decking.

C. Verify support work has been constructed to allow accurate placement and alignment of anchor bolts and other connections to supporting assemblies.

D. Verify substrates to determine that conditions are acceptable for installation of decking in accordance with manufacturer's written instructions.

3.02 INSTALLATION - GENERAL

3.03 INSTALLATION - PLASTIC COMPOSITE DECKING

A. Install decking in accordance with manufacturer's published instructions, subject to conditions of its evaluation report.

3.04 TOLERANCES

A. Install decking complying with installation tolerances indicated in ANSI/ACMA/PIC (CSP).

3.05 PROTECTION

A. Protect installed decking from subsequent construction operations.

END OF SECTION

SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Bituminous dampproofing system applied to below grade foundations.

B. Protection boards.

C. Drainage panels with filter fabric.

1.02 REFERENCE STANDARDS

A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bituminous Dampproofing Manufacturers:
   1. Karnak Corporation: www.karnakcorp.com.
   2. Mar-Flex Systems, Inc: www.mar-flex.com/sle.
   3. W. R. Meadows, Inc: www.wrmeadows.com/sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.
   2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.
   3. VOC Content: Not more than permitted by local, State, and federal regulations.
   4. Applied Thickness: 1/16 inch, minimum, wet film.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Apply bitumen with mop.

C. Apply from 2 inches below finish grade elevation down to top of footings.

D. Seal items watertight with mastic, that project through dampproofing surface.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing system with drainage panels at below-grade foundations and elevator pit.
   1. Self-adhered modified bituminous sheet membrane.
   2. Composite HDPE/Bentonite sheet membrane.

1.02 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

B. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

C. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 MOCK-UP

A. Construct mock-up consisting of 100 sq ft of horizontal waterproofed panel; to represent finished work including internal and external corners.

B. Locate where directed.

C. Mock-up may remain as part of this Work.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Membrane:

1. Location: ____.
2. Cover with protection board and drainage panel.

B. Composite HDPE/Bentonite Sheet Membrane:
1. Location: _____.
2. Cover with drainage panel & protection board.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
1. Thickness: 60 mils, 0.060 inch, minimum.
2. Sheet Width: 36 inches, minimum.
3. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
4. Tensile Strength:
a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches per minute.
b. Membrane: 325 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
5. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
6. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
7. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
8. Peel Strength: 7 pounds per inch, minimum, when tested according to ASTM D903.
9. Lap Adhesion Strength: 5 pounds per inch, minimum, when tested according to ASTM D1876.
10. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154/E154M.
11. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
12. Hydrostatic Resistance: Resists the weight of 200 feet when tested according to ASTM D5385/D5385M.
13. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
14. Manufacturers:
a. Polyguard Products, Inc; 650 Membrane: www.polyguardproducts.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

B. Composite HDPE/Bentonite Sheet Membrane: Comprised of black/gray HDPE and granular bentonite with spun polypropylene fabric facing.
1. Sheet Width: 4 feet, minimum.
2. Bentonite: Granulated pure, dry, bentonite clay compromised of 90 percent minimum sodium montmorillonite; 90 percent minimum passing No. 20 mesh sieve and 10 percent maximum passing No. 200 mesh sieve.
a. Minimum bentonite content: 1 lb/sq ft.
3. With compatible waterstop devices and 4 inch (100 mm) wide rubberized asphalt seam tape.
4. Tensile Strength: 4000 psi, measured in accordance with ASTM D412.
5. Water Vapor Permeability: 2.7 x 10 -13 cm/sec or _ perm inch measured in accordance with ASTM E96/E96M.
6. Manufacturers:
a. CETCO, a division of Minerals Technologies Inc; ULTRASEAL: www.mineralstech.com/#sle.
b. Epro Services, Inc; Bento-Pro Plus: www.eproserv.com/#sle.
c. Tremco Commercial Sealants & Waterproofing; Paraseal: www.tremcosealants.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealant for Substrate Surfaces: Type ____ as specified in Section 07 9200.

B. Protection Board: Provide type capable of preventing damage to waterproofing due to backfilling and construction traffic.
   1. Polystyrene foam board, 1 inch thick.

C. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene core; polypropylene filter fabric.

D. Cant Strips: Premolded composition material.

E. Termination bars: Stainless steel or Aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Install cant strips at all 90 degree vertical transitions in foundation walls. Membrane to extent minimum 12 inches horizontally on foundation.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.

I. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

A. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.

B. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.

C. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.

D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, and exterior wall behind masonry or siding wall finish.

B. Batt insulation in exterior and interior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Installation schedule: Provide description of locations where each proposed product will be installed. Include description of compliance with fire rated, acoustical and NFPA 285 details.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATION SCHEDULE

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundations, below grade: Extruded polystyrene (XPS) board.

C. Insulation at Perimeter of Foundations, above grade: Mineral Wool Board.

D. Insulation as Protection Board at Foundations, below grade only: Extruded polystyrene (XPS) board.

E. Insulation Inside Cavity of Masonry Veneer Walls, below grade only: Etruded polystyrene (XPS) board.

F. Insulation on Inside Cavity of Masonry Veneer Walls, above grade: Mineral Wool board.

G. Insulation on exterior face of sheathing: Mineral Wool board.

H. Insulation behind exterior Metal Wall Panels: Mineral Wood board.

I. Insulation inside STC and Fire Rated partitions: SAFB Mineral Wool Insulation, no vapor retarder.

J. Insulation inside exterior metal framing walls: Batt insulation with no vapor retarder

K. Insulation inside metal framed partitions: Batt insulation with no vapor retarder.

L. Insulation inside Wood Framed Walls: Batt insulation with no vapor retarder.

M. Insulation in Framed Ceiling Structure: Batt insulation with separate vapor retarder.

N. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation **(XPS)**: ASTM C578, Type IV; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: 1-1/2 inches, or unless indicated otherwise.
   5. Board Edges: Shiplap.
   6. Thermal Conductivity (k factor) at 25 degrees F: 0.18 (R= 5 minimum per inch).
   7. Compressive Resistance: 25 psi.
   8. Manufacturers:
      a. Dow Chemical Company: www.dow.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Mineral Wool Board Insulation: Rigid or semi-rigid stone wool insulation, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Combustibility: Behavior of material at 750 degrees as non-combustible per ASTM E136.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Board Size: 16 by 48 inches standard, size varies by manufactuer,.
   4. Board Thickness: 2 inches and/or as indicated on drawings.
   5. Thermal Resistance: R-value of 4.3 per inch at 75 degrees F, minimum, when tested according to ASTM C518.
   6. Minimum Density: 4.3 pound per cubic foot, nominal.
   7. Manufacturers:
      a. Johns Manville;CladStone 45 ____: www.jm.com/#sle.
      b. ROCKWOOL (ROXUL, Inc); CAVITYROCK: www.rockwool.com/#sle.
      c. Thermafiber, Inc;RainBarrier ic HC 80 _____: www.thermafiber.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or SAFB mineral wool insulation may be used, at Contractor's option, unless specifically noted or required otherwise.
   1. Use Sound Attenuation Fire Blanket (SAFB) Mineral Wool at all fire rated assemblies and STC rated wall per drawings and partition schedule and as required by code/UL test.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value of 3.5 per inch minimum.
   6. Thickness: Match cavity thickness or as indicated on drawings or insulation schedule.
   7. Facing: Unfaced.
   8. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/#sle.
      b. Johns Manville: www.jm.com/#sle.
      c. Knauf Insulation GmbH: www.knaufinsulation.us.
      d. Owens Corning Corp: www.owenscorning.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

C. Sound Attenuation Fire Blanket (SAFB) Mineral Wool: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Thermal Resistance: R-value of 3.5 per inch, minimum.
   4. Thickness: Match cavity thickness, indicated on drawings or per insulation schedule.
   5. Manufacturers:
      a. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
      b. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Wire Mesh: Galvanized steel, hexagonal wire mesh.

D. Protection Board for Below Grade Insulation: XPS, 1 inch thick.

E. Adhesive: Type recommended by insulation manufacturer for application.

F. Spray-foam Insulation: See slso Section 07 2119.
   1. Polyurethane expanding foam.
   2. Products: DuPont Great Stuff; www.greatstuff.dupont.com
   3. Dupont Great Stuff

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over building expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Mechanically fasten insulation boards to sheathing with rust resistant screws and 2" diameter rigid plastic washers to allow secure attachment.
   1. Install 24 inches each way or as prescribed by insulation manufacturer.

C. Install boards horizontally on walls.
   1. Install in running bond pattern.
   2. Butt edges and ends tightly to adjacent boards and protrusions.

D. Extend boards over expansion joints, unbonded to wall on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation.

3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at following frequency:
   1. Six (6) per insulation board.

B. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Install boards to fit snugly between wall ties.

D. Install boards horizontally on walls.
   1. Install in running bond pattern.
   2. Butt edges and ends tightly to adjacent boards and protrusions.
   3. Place impale fastener locking discs.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

D. Install spray-foam insulation around gaps and voids in penetrations through board insulation.

3.06 BOARD INSTALLATION OVER STEEP SLOPE ROOF SHEATHING OR ROOF STRUCTURE

A. Installation of board insulation over steep slope roof structure or roof sheathing is specified in Section 06 1000.

3.07 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in interior sound attenuated and exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Cut and form insulation as necessary to fully fill all cavities and void spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At attic locations with gyp-bd ceilings, use spray foam around all penetrations through gyp-bd layer. Apply to seal all air leakage around pentrations and to insluate around device. Fill voids around plumbing pipes, conduits, wiring, junction boxes, etc poking though attic ceiling layer.

F. Install insulation in thicknesses required to achieve minimum desired R-values below; unless noted otherwise.
   1. Walls: R-19
   2. Floors: R-13
   3. Floors above unconditioned spaces: R-19
   4. Ceilings at unconditioned attic spaces: R-29

G. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation. Fill shim spaces around window perimeters full with batt insulation or low-expanion spray-foam insulation.

3.08 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Foamed-in-place insulation installed as part of the exterior building thermal envelope.

B. At junctions of dissimilar wall and roof materials.

C. At roof valleys and ridges.

D. All other locations as shown on drawings.

E. Protective intumescent coating.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2014.

C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements and shop drawings identifying locations being applied.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

D. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Field Density testing: Take field samples daily and provide report on density of samples.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.07 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

MANUFACTURERS

2.01 FOAMED-IN-PLACE INSULATION:

A. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.

B. Icynene-Lapolla; Icynene ProSeal (MD-C-200 v3): www.icynene.com/#sle.

C. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   2. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   3. Water Absorption: Less than 1 percent by volume, maximum, when tested in accordance with ASTM D2842.
   4. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   5. Closed Cell Content: At least 90 percent.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   7. Density: 2.0 lbs/cuft, nominal, in accordance with ASTM D1622/D1622M.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Overcoat: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes. Reference 078100 Applied Fire Protection, Monokote Z-3306/G

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R-value of 20.

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Trim excess away for applied trim or remove as required for continuous sealant bead.

G. Apply insulation inside of building at all transitions from wall to roof, at underside of all roof ridges, hips and valleys, all penetrations through roofs, and as otherwise indicated at drawings.

H. Apply overcoat to surface at locations where it is not concealed behind 1/2" thick gypsum board. Overcoat to be equivalent to a 15 minute thermal barrier as required by IBC.

3.04 FIELD QUALITY CONTROL

A. Inspection will include verification of insulation and overcoat thickness and density. Installer to take daily tests and maintain a log of tests and areas performed.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Weather Barrier Assemblies: Under exterior wall cladding, over sheathing or applied to substrate; that resists the transmission of air and is moisture permeable.

B. Transition Membrane: Membrane products that span joints between different types of substrates to provide continuity

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

D. Flashing: Materials that form a system to move liquid water to the outside of the exterior walls typically occurring at wall transitions and openings.

1.02 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

G. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc.; 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

1.04 MOCK-UP

A. Install weather barrier materials in mock-up.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:
   1. At concrete walls: On the outside surface of the concrete use air barrier coating.
   2. At Masonry wall construction: On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
   3. At framed walls with Masonry Veneer: On outside surface of sheathing of exterior walls use air barrier coating. Where continuous insulation is used in conjunction with masonry veneer cavity, insulation will be applied to surface of installed air barrier.

B. Vapor Retarder:
   1. At underside of slab on grade concrete floors use vapor retarder sheet. Reference specification 03 3000.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier (Weather Barrier) Coating:
   1. Material: Water-based acrylic or polymer-modified bitumen.
   2. Dry Film Thickness: 20 mils (0.020 inch), minimum. Verify with manufacturer.
   3. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
   4. Water Vapor Permeance: 12 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
   5. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for up to 4 months of weather exposure after application.
   6. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
   7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   8. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
   9. VOC Content: 25 g per L or less.
   10. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
   11. Manufacturers:
      a. BASF Corporation; ENERSHIELD-HP: www.master-builders-solutions.basf.us/#sle.
      b. Carlisle Coatings and Waterproofing, Inc.; Barritech-VP: www.carlisle-ccw.com.
      c. DuPont Building Innovations; Tyvek Fluid Applied WB, Fluid Applied Flashing - Brush Formulation, Fluid Applied Flashing & Joint Compound, and Sealant for Fluid Applied System: www.dupont.com.
      d. Parex USA, Inc; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/#sle.
      e. PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.
      f. W.R. Meadows, Inc.; Air-Shield LMP: www.wrmeadows.com.
      g. Tremco; ExoAir 230: www.tremcosealants.com.
      h. Substitutions: See Section 01 6000 - Product Requirements.

2.03 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Sheet : See specification section 03 3000.

2.04 SEALANTS

A. Butyl Sealant: as specified in Section 07 9200.

B. Sealants: as specified in Section 07 9200.

C. Polyurethane Sealant: as specified in Section 07 9200.

D. Sealant Backers: As specified in Section 07 9200.

E. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.05 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Thickness: 40 mil, 0.040 inch, nominal.
   2. Manufacturers:
      a. Carlisle Coatings and Waterproofing, Inc.; CCW-705 TFW: www.carlisle-ccw.com.
      b. Intertape Polymer Group, Inc; NovaFlash SA Universal Self-Adhered Flashing (25 mil): www.itape.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions. Coordinate installation with products installed in openings and penetrations.

B. Air Barriers & Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Fluid Coatings (Spray or Roll Applied):
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal air tight with sealant.
   4. Use flashing to seal to adjacent construction and to bridge joints.

D. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange. Install weather barrier into opening beyond the inside face of opening frame. Coordinate depth with opening unit.
   3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between opening unit frame and rough framing, flashing around opening perimeter using joint sealant over backer rod and sealed directly to the weather barrier.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

B. Do not cover installed weather barriers until required inspections have been completed.

C. Take digital photographs of each portion of the installation prior to covering up.
   1. Photograph each penetration through weather barrier prior to concealing from view.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 3113
ASPHALT SHINGLES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Asphalt shingle roofing with underlayments installed on sloped roof sheathing.

B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

C. Associated metal flashings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

C. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016.

D. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2010a.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).

F. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2025.

G. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2013.

H. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2012.

I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating material characteristics and performance criteria.

C. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.

D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.

E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Products are Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.

1.05 MOCK-UP

A. Provide mock-up of 10 sq ft, including protection membrane, underlayment, shingles, and associated flashings.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.07 WARRANTY

A. Manufacturer's Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
   1. Material Warranty Period: 30 years from the date of Substantial Completion.
   2. Algae-Discoloration Warranty Period: Shingles will not discolor 25 years from date of Substantial Completion.
   3. Wind Damage Warranty: Limited Warranty against damage from wind up to 130 mph.

B. Installers Warranty: Provided warranty in which installer agrees to repair and replace components of the asphalt shingle roofing system that fail in materials or workmanship within 2 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. GAF; Slateline: www.gaf.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   1. Fire Resistance: Class A, complying with ASTM E108.
   2. Wind Resistance: Class A, when tested in accordance with ASTM D3161/D3161M.
   3. Warranted Wind Speed: 130 mph.
   4. Algae Resistant; granules treated to resist algae discoloration.
   5. Weight: 90 lb/100 sq ft.
   6. Self-sealing type.
   7. Style: Laminated overlay (architectural shingles).
   8. Color: As selected by Architect from Manufacturer's full color range.

2.03 SHEET MATERIALS

A. Protection Membrane (Eave Protection, Ice barrier): Self-adhering polymer-modified asphalt sheet complying with ASTM D1970; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
   1. Manufacturers:
      a. GAF; Storm Guard: www.gaf.com
      b. Owen Cornings; WeatherLock Mat Self-Sealing Ice & Water Barrier: www.owencornings.com.
      c. CertainTeed; Winter Guard Granular: www.certainteed.com.
      d. Grace Construction Products; Grace Ice & Water Shield : http://gcpat.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Underlayment (Standard for Entire roof surface): Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams. 20 mils minimum thickness.
   1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
   2. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
   3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   5. Fasteners: As recommended by manufacturer or building code qualification report or approval.
   6. Manufacturers:
      a. CertainTeed; Roof Runner: www.certainteed.com.
      b. OwenCornings; RhinoRoof U20: www.owencorning.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8 inch head diameter, 10 gage, 0.1019 inch nail shank diameter, 3/4 inch long or sufficient length to penetrate through roof sheathing or decking and complying with ASTM F1667.

B. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.

C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.

D. Ridge and Hip Vents: Plastic, extruded with vent openings that do not permit direct water or weather entry; flanged to receive shingles. Hip vents installed must be warranted for use at Hip locations.
   1. Lomanco; OmniRidge Model LOR-30: www.lomanco.com.
   2. GAF; Cobra Ridge Vent 3: www.gaf.com
   3. GAF; Cobra Hip Vent: www.gaf.com
   4. Air Vent Inc; Hip Ridge Vent: www.airvent.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.05 METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, open valley flashing, chimney flashing, dormer flashing, other flashing indicated, and drip edge.

B. Flashing and Sheet Metals: See Section 07 6200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that roof deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.

B. At areas where protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or protection membrane.

D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced ____ inches on center.

3.03 INSTALLATION - PROTECTION MEMBRANE

A. Install protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

B. Install protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

C. At exposed valleys: Install one layer of protection membrane, 36 inches wide centered over open valley. Weather lap edges 6 inches minimum.

D. Install protection membrane, minimum 18" wide, centered over intersecting planes of roof surfaces, vertical protrusions, and plane terminations such as rakes, hips, dormers, wall intersection, etc.

3.04 INSTALLATION - UNDERLAYMENT

A. At Roof Slopes Up to 4:12 : Install two layers of underlayment perpendicular to slope of roof over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.

B. At Roof Slopes Greater Than 4:12 : Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place. Weather lap minimum 4 inches over protection membranes.

C. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.05 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

C. Secure in place with nails at ____ inches on center, and conceal fastenings.

D. Install sheet metal flashings at perimeters of all valleys, crickets, chimney, roof curbs and other similar penetrations.

1. At Exposed Valleys: Install one layer of sheet metal flashing, minimum [18] inches wide, centered over open valley and crimped to guide water. Weather lap joints minimum 2 inch wide band of lap cement along each edge of first, press roll roofing into cement, and nail in place minimum 18 inches on center, 1 inch from edges.

E. Provide metal drip edges at fascia boards.

F. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.06 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.

1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Extend shingles on one slope across valley and fasten. Trim shingles from other slope 2 inches, or as detailed, from valley center line to achieve closed cut valley, concealing the valley protection.

F. Cap hips with individual shingles, maintaining 5 inch weather exposure, and place to avoid exposed nails.

G. After installation, place one daub of plastic cement, one inch diameter under each individual shingle tab exposed to weather, to prevent lifting.

H. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

I. Complete installation to provide weather tight service.

3.07 PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 4646
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.06 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Provide multi-year manufacturer warranty as indicated under Siding article sub-heading "Warranty".

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: Standard lap style.
   2. Texture: Smooth.
   3. Width (Height): 5-1/4 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Unfinished.
   6. Color: As indicated on drawings.
   7. Color: As selected by Architect from manufacturers full range of available colors.
   8. Warranty: 50 year limited; transferable.
   9. Manufacturers:
      a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.

B. Soffit Panels: Smooth panels of same material and finish.

C. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

1. Texture: Smooth.
2. Length: 96 inches, nominal.
3. Width: 48 inches.
4. Thickness: 5/16 inch, nominal.
5. Finish: Unfinished.
6. Manufacturer: Same as siding.

2.02 ACCESSORIES

A. Trim: Same material and texture as siding.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

C. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
1. Read warranty and comply with terms necessary to maintain warranty coverage.
2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
3. Use trim details indicated on drawings.
4. Touch up field cut edges before installing.
5. Pre-drill nail holes if necessary to prevent breakage.

B. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

C. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

D. Finish Painting: Refer to Section 09 9113.

3.03 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Single ply thermoplastic roofing membrane fully adhered system.

B. Insulation, flat and tapered.

C. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

E. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2013.

F. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2024.

G. FM (AG) - FM Approval Guide; current edition.

H. FM DS 1-28 - Wind Design; 2007.

I. NRCA (RM) - The NRCA Roofing Manual; 2017.

J. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog data for membrane materials including flashing materials, insulation, fasteners, and adhesives.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, mechanical fastener layout, and paver layout.
   1. Include UL Assembly and FM Assembly Compliance.

D. Wind resistance documentation including uplift wind pressures, calculations, assembly installation methods and manufacturer's certification on uplift pressures.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's Qualification Statement.

G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions.

H. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

I. Manufacturer's Qualification Statement.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer. Provide letter from manufacturer indicating intent to warrant the roofing system.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.07 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's Warranty:
   1. Material Warranty: Provide single-source manufacturer's No Dollar Limit (NDL) warranty for weathertightness of roofing system, include agreement to repair and/or replace roofing that fails to keep out water within specified warranty period of 20 years from date of Substantial Completion.
   2. Warranty coverage to include roofing membrane, base flashings, liquid applied flashing, roofing membrane accessories, roof insulation, fasteners, cover board, walkway products, manufacturer's expansion joints, edge metal products, parapet caps, and other single-source components of roofing system marketed by the manufacturer.

C. Installer's Warranty: Provide warranty in which installer agrees to repair and replace components of the roofing system that fail in materials or workmanship within 2 years from the date of Substantial Completion.
   1. Warranty coverage to include work of the Section, including all components of roofing system such as membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders and walkway products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Materials:
   1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlislesyntec.com.
   2. Firestone Building Products, LLC; UltraPly TPO: www.firestonebpco.com/#sle.
   3. GAF; EverGuard TPO: www.gaf.com/#sle.
   4. Johns Manville CorporationJM TPO: www.jm.com..
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Atlas Roofing Corporation: www.atlasroofing.com.
   2. Carlisle SynTec; SecurShield Insulation: www.carlisle-syntec.com/#sle.
   3. GAF: www.gaf.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING SYSTEM DESCRIPTION

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing System Requirements:
   1. Warranty: Full system warranty covering membrane, roof insulation, and membrane accessories.
   2. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
      a. Field applied coating may not be used to achieve specified SRI.
   3. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
   4. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
   5. Wind resistance: Roofing system must be successfully tested by a qualified testing agency following ANSI/FM 4474 to resist the design uplift pressures calculated by the American Society of Civil Engineers (ASCE) 7 and after multiplying the results with a safety factor (determined by design professional), but assembly uplift pressures shall be not less than 60 lbs. / sq. ft.
   6. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required to achieve minimum LTTR of 26 at any location.

C. Roofing System Components: Listed in order from the top of the roof down:
   1. Membrane: Thicknesses as specified, fully adhered.
   2. Coverboard Over Insulation: Mechanically attached.
   3. Insulation: Mechanically attached.
   4. Structural base.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
      a. Thickness: 60 mil, 0.060 inch, minimum.

B. Flexible Flashing Material: Same material as membrane.

C. Water Pervious Fabric: Woven polyethylene, UV stabilized, open to moisture movement, black.

2.04 DECK SHEATHING & COVERBOARD

A. Deck Sheathing & Coverboard : Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 5/8 inch, Type X, fire resistant.
   2. Manufacturers:
      a. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com/#sle.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
   2. Board Size: 48 by 96 inch.
   3. Board Thickness: 2.0 inch. minimum. Provide insulation in layers as necessary to achieve specified LTTR, minimum 2 layers of insulation.
   4. Tapered Board: Slope as indicated; minimum thickness 0.5 inch; fabricate of fewest layers possible.

2.06 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Sheet Metal Flashings: See Section 07 6200.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

D. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

E. Insulation Adhesive: As recommended by insulation manufacturer.

F. Sealants: As recommended by membrane manufacturer.

G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Size: 18 by 18 inch.
   3. Surface Color: White or yellow.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.03 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

G. Install blocking at all locations where fastening occurs where structure is not locationed. Blocking required but not limited at parapets, termination bars, and as shown on drawings.

3.04 INSULATION APPLICATION - UNDER MEMBRANE

A. Attachment of Insulation:
   1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

B. Cover Boards: Fully adhere cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

G. Install tapered insulation at roof drain counterslope to be twice the main roof slope.

H. Do not apply more insulation than can be covered with membrane in same day.

3.05 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls. Adhesive amount must conform to FM Assembly requirements.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto all vertical surfaces.
   2. At parapet and roof edge locations, extend membrane system up vertical surface, under parapet cap to outside edge of parapet.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings.

I. Seal perimeter of entire roofing system membrane to weather barrier.

3.06 FINISHING UNBALLASTED SURFACES

A. Install walkway pads. Space pad joints to permit drainage.

B. Place walkway pads around perimeter of all rooftop mounted equipment, roof hatches, ladders, roof access doors and/or as indicated on drawings. Provide paths from roof access locations to all rooftop equipment.

3.07 FIELD QUALITY CONTROL

A. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.08 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

A. Protect installed roofing and flashings from construction operations. Daily remove any object(s) that may cause damage to roofing system.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and copings.

B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

E. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

F. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2012).

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).

H. CDA A4050 - Copper in Architecture - Handbook; current edition.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, material thickness, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit one sample, 12 x 12 inch minimum in size illustrating material and fabrication details of typical standing seam profiles.

D. Samples: Submit two samples 3 x 5 inch in size illustrating metal finish color.
   1. Color chart can be submitted preliminary as long as a physical sample is submitted for final approval

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 3 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Reference roofing specifications for warranty limits and terms that apply. Products or fabrications installed with the roofing system to contain manufacturer's warranty as specified in roofing specification section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   2. Metal Era Inc. www.metalera.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SHEET MATERIALS

A. Copper: ASTM B370, cold rolled 16 oz/sq ft (24 gage) (0.0216 inch) thick; pre-patinated finish.

2.03 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Form sections true to shape, accurate in size, square, and free from distortion or defects. Fabricate metal flashing and trim without excessive oil canning, buckling and tool marks, true to line and levels indicated with exposed edges folded back to form hems.

D. Form pieces in longest possible lengths to a maximum of 15 feet unless specifically approved otherwise by Architect. Treat seams between two different pieces with flat-lock seams at non-moving joints, unless otherwise indicated. At moving seams, use seated, lapped, bayonet type or interlocking hooked seams.

E. All exposed edges to be folded back with hem of 1/2 inch; miter and seam corners.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

H. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joint of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints. Provide for expansion no more than in 40 feet long sections.

I. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

J. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
   1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than the thickness of the metal being secured.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: Profile as indicated - 6".
   1. Lengths to be continuous no longer than 40 foot sections.
   2. Joints to be flat-lock seam with sealant.
   3. Corners to be factory mitered and welded.
   4. Expansion joints to have end of each gutter capped, allow for 1" of expansion between gutters and covered with coverplate.

B. Downspouts: Profile as indicated 4" wide x 3" deep or unless indicated otherwise.

1. Same as Gutters except: Vertical seams to be Double Corner Seam with sealant.

C. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements with Stainless Steel or Aluminum fasteners.
   2. Gutter Supports: Straps of size per SMACNA requirements, but not less than twice the thickness of the gutter material.
   3. Downspout Supports: Straps.
   4. Expansion Joints: Butt type, with cover plate same material as gutter.
   5. Valley Diverters: 12-inch x 12-inch minimum at valley, 0.040 inch thick minimum. Extend a minimum of 4" above eave edge.

D. Downspout Boots: brass.

E. Seal metal joints, see Joint Sealants.

2.05 ACCESSORIES

A. Fasteners: Aluminum or Stainless Steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.

E. Flexible Flashing: Self-adhered flashing as specified in Section 07 2500.

F. Sealants: Type as specified in Section 07 9200.

G. Plastic Cement: ASTM D4586/D4586M, Type I.

2.06 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Straight Copings/Parapet Caps: Fabricate in minimum 8-foot long, but not exceeding 10-foot long sections. Fabricate joint plates of same thickness as copings and in method recommended by SMACNA for parapet width.
   1. System components must comply with FMG Loss Prevention Data Sheet 1-49 and compliance with ES-1 rated systems.
   2. Joints to be butt joint with backup plate, coverplate and spring at underside of joint.
   3. Copings to have continuous cleat on both sides, no exposed fasteners.
   4. Corners to have factory mitered and welded seams. Quik-lok seams may be permissible upon review & pre-approval only.

B. Accessories:
   1. Splice Plates: Same thickness as coping, minimum.
   2. Cleats: Same thickness as coping, minimum.

2.07 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Constructions: Fabricate head, sill and similar flashing to extend beyond openings as indicated. Unless otherwise indicated, form head and sill flashing with 2-inch high end dams.

2.08 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Beam and Column Surrounds: Fabricate as detailed, reinforced as required for a smooth, even appearance without oil-canning or distortions, with tight seams and all exposed edges hemmed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION GENERAL

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted. Install system to comply with FMG or ES-1 system ratings.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners. Pop-rivets are not concealed Fasteners.

F. Connect downspouts to downspout boots, and grout connection watertight.

G. Finishes: Touchup all scratches to painted finish in field with paint to match.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 24 inches apart. Provide enclosures and seal watertight with sealant. Slope gutters 1/4 inch per 10 feet minimum to downspouts.
   1. Fasten gutter spacers to front and back of gutter.
   2. Loosely lock straps to front gutter bead and anchor to roof deck.
   3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   4. Anchor back of gutter that extends onto roof deck with cleats spaces not more than 24 inches apart.
   5. Install gutter with expansion joints at locations indicated or not exceeding 40 feet apart.

C. Downspouts: Join sections with 1-1/2" telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
   2. Secure downspouts to building with straps and mechanical fasteners. Do not use pop-rivets.
   3. Provide elbows at base of downspout to direct water away from building.

D. Collection Boxes: Anchor securely to wall.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, an level as indicated. Install work with laps, joints ans seams that will be permanently watertight.

B. Roof Edge Flashing and Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Comply with installation requirements of roofing manufacturer regarding spacing of anchors below membrane flashing in field of roof.
   1. Install flexible flashing covering entire substrate beneath coping; not required where roofing material extends beneath coping. Seal perimeters against weather barrier and/or roofing.
   2. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at minimum 8-inch centers.

C. Pipe or Post Counterflashing: Install counter flashing umbrella with close -fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches of base of flashing. Install stainless steel draw band and tighten.

D. Counterflashing: Coordinate installation of counter flashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
   1. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetration moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill and similar flashings to extend beyond wall openings a minimum of 4 inches or as indicated.

C. Install reglets per manufacturer's recommendations.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Roof hatches.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF HATCHES

A. Roof Hatch Manufacturers:
   1. Acudor Products Inc; Galvanized Steel Roof Hatch: www.acudor.com/#sle.
   2. Bilco Company; Type TB (various types and special size): www.bilco.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
   2. Mounting Substrate: Provide frames and curbs suitable for mounting on standing seam metal roof panel system.
   3. For Ladder Access: Single leaf; 30 by 36 inches.
   4. For Ships Ladder Access: Single leaf; 30 by 54 inches.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Stainless steel, Type 304, 14 gage, 0.0747 inch thick.
   2. Finish: Factory prime paint.
   3. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
   4. Curb Height: 12 inches from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf live load.
   2. Material: Galvanized steel; outer cover 14 gage, 0.0747 inch thick, liner 22 gage, 0.03 inch thick.
   3. Finish: Factory prime paint.
   4. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
   5. Gasket: Neoprene, continuous around cover perimeter.

E. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
   1. Comply with 29 CFR 1910.23, with a safety factor of two.

2. Posts and Rails: Aluminum tube.
3. Gate: Same material as railing; automatic closing with latch.
4. Finish: Manufacturer's standard, factory applied finish.
5. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
6. Fasteners: Stainless steel, Type 316.
7. Manufacturers:
    a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

G. Ladder Safety Post: Manufacturer's standard accessory ladder safety post extension to extend 42 inches above a landing platform with spring assisted telescoping design.
1. Post: Powder coated steel, safety yellow color.
2. Accessories: As required for a complete installation.
3. Provide at all roof hatches with vertical fixed ladder below.
4. Manufacturers:
    a. Babock-Davis Inc.; Model BSP: www.babockdavis.com.
    b. Substitutions: See Sectoin 01 6000 - Product Requirements

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 7600
ROOF PAVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof pavers.

B. Pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 5400 - Thermoplastic Membrane Roofing: Substrate for roof paver system.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASTM C936/C936M - Standard Specification for Solid Concrete Interlocking Paving Units; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating paver and pedestal materials.

C. Shop Drawings: Submit shop drawings that indicate paver and pedestal layout, including overall plan and detail drawings of system components.

D. Samples of Pavers: Submit two samples for each type, color and texture indicated.

E. Manufacturer's Installation Instructions: Indicate substrate precautions, special procedures, and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit documentation from installer that installation complies with warranty conditions for roof paver system.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store materials at least 4 inches above ground in dry location, and covered with polyethylene sheet to protect from contact with materials that may cause staining or discoloration.

1.08 FIELD CONDITIONS

A. Do not install roof paver components during cold or wet weather conditions.

1.09 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Manufacturer Warranty: Provide 10-year manufacturer warranty to replace material that shows manufacturing defects. Complete forms in Owner's name and register with manufacturer.

C. Installer Warranty: Provide 2-year warranty for defects of labor and/or workmanship commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 ROOF PAVERS

A. Roofing System: See Section 07 5400 for information on roofing system where pavers are being installed.

B. Precast Concrete Roof Pavers: Precast concrete tiles, with texture and color as indicated; supported by adjustable pedestal system.
   1. Comply with local wind load resistance requirements of ASCE 7.
   2. Texture and Color: As selected by Architect from manufacturer's standard line.
   3. Length and Width: 23-7/8 by 23-7/8 inches, nominal.
   4. Thickness: 2 inches, nominal.
   5. Compressive Strength: ASTM C936/C936M, not less than 8500 psi.
   6. Absorption: ASTM C936/C936M, not greater than 4 %.
   7. Modulus of Rupture: 1100 psi, minimum.
   8. Products:
      a. Hanover Architectural Products, Inc; Roof Pavers: www.hanoverpavers.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PEDESTALS

A. Pedestals: High-density polyethylene with integral spacer ribs on upper surface to ensure even joint spacing.
   1. Pedestals may be separated into halves or quarters to accommodate perimeter-edge and corner support.
   2. Unit Size: 4 by 4 inches with spacer rib.
   3. Spacer Rib: 1/8 inch wide.
   4. Weatherability: Not affected by freeze-thaw cycles, ozone, humidity, and is not water-absorbent.
   5. Leveling Plates: 1/16 inch thick.
   6. Products:
      a. Hanover Architectural Products, Inc; Polyethylene Pedestals: www.hanoverpavers.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Fixed Height Support Pads: Stackable rubber support pads for placement of porcelain or concrete pavers over hard surfaces. Integrated spacer tabs ensure precise paver spacing and alignment.
   1. Rubber material provides sound deadening and shock reduction. Stackable nature of pads allows installation on sloping substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive this work.

B. Verify substrate is supported and secure.

C. Verify substrate is clean and smooth, dry and free of snow or ice, flat without depressions, waves or projections, properly sloped and suitable for installation of roof paver system.

D. Verify that roof openings, curbs, and penetrations through roof are solidly set.

E. Verify system elevations, required pedestal heights, and substrate dimensions.

3.02 PREPARATION

A. Use of pedestal system is for pedestrian traffic only and each side of deck system must be restrained containing decking panels with perimeter blocking or walls; movement of decking panels laterally is not permitted.

B. Membrane waterproofing and protection board surfaces used to support pedestals to be broom clean, free of frost, dirt, oil or any rough foreign matter that may impair substrate material manufacturer's warranty requirements.

C. Provide substrate for pedestals with slope and positive drainage in accordance with applicable building codes.

D. Substrate surface that will support paver and pedestal system must be structurally capable of carrying dead and live loads anticipated.

1. Insulation Under Roofing Membrane: Insulation installed within a roofing system below roof paver supports must meet roofing membrane manufacturer's recommended installation instructions and have compressive strength of at least 60 psi.

E. Commencement of this work implies acceptance of surfaces and substrate conditions.

3.03 INSTALLATION

A. Perform work in accordance with manufacturer's written installation instructions and applicable requirements in coordination with project attributes, paver type being installed, pattern, grid layout, starting point, and finished elevation as indicated on approved shop drawings.

B. Install pavers on pedestals in accordance with manufacturer's instructions.

1. Fully support edges; shim and adjust pavers to provide level surface.
2. Provide approximately 1/8 inch space between pavers to permit surface water drainage.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect during installation to ensure that grid spacer lines are being maintained in a straight and consistent pattern and that deck roof pavers are level and not rocking.

C. Unless otherwise specified in writing to allow for expansion, inspect to ensure that spacing between pavers at perimeter walls does not exceed a tab width.

D. Inspect during installation to ensure that pedestrian entry or access points to roof paver areas are level and that pavers are not randomly raised or uneven creating a tripping or safety hazard.

E. Verify that deck pedestal heights in excess of 16 inches have been braced in accordance with manufacturers written installation instructions.

3.05 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove markings from finished surfaces, or replace defaced components of roof pavers system if markings cannot be removed.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.06 PROTECTION

A. Protect installed roof pavers from construction operations.

B. Where traffic must continue over finished roof pavers, protect surfaces using durable materials.

3.07 MAINTENANCE

A. Owner of roof paving system must perform routine maintenance of system; check for rocking pavers and adjust using T-Handle Hex Key or shims immediately; pedestals can settle and may need to be realigned, and failure to do so can create a tripping hazard.

B. Periodically check spacer tabs and immediately replace broken tabs to limit deck movement.

END OF SECTION

SECTION 07 8100
APPLIED FIRE PROTECTION

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

B. Preparation of fireproofing for application of exposed finish specified elsewhere.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.

D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2015)e1.

F. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2023).

G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

E. Field Quality Control Submittals: Submit field test report.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.07 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fireproofing:
   1. GCP Applied Technologies: www.gcpat.com/#sle.
   2. Isolatek International Corp: www.isolatek.com/#sle.
   3. Southwest Fireproofing Products Company: www.sfrm.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. Provide fire resistance ratings for following building elements as identified on drawings and as required by local building code:
   1. Primary structural frame, including columns, girders, and trusses, 0 hour.
   2. Floor construction, including supporting beams and joists, 1 hour.
   3. Roof construction, including supporting beams and joists, 1 hour.

C. Provide fire-rated assembly ratings to UL Design Nos. as follows or as drawings indicate:
   1. Interior columns: One & Two hours; UL No. X829 & UL-X827.
   2. Interior girders: One and Two hours; UL No. D902.
   3. Interior floors: Two hours; UL No. D902.
      a. Concrete Floors: One hour; UL No. N706
      b. Wood Floors: One hour, UL No. L570
   4. Interior roof deck: One hour; UL No. P819.
   5. Roof/Ceiling: One hour; UL No. P522.

2.03 MATERIALS

A. Applied Fireproofing Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
   1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
   2. Dry Density: 21 lb/cu ft, minimum, when tested in accordance with ASTM E605/E605M.
   3. Compressive Strength: 31 pounds per square inch, minimum.
   4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
   5. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
   6. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.

7. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fireproofing manufacturer.

B. Overcoat: As recommended by manufacturer of applied fireproofing material.

C. Metal Lath: Expanded metal lath; minimum weight of 1.7 psf, galvanized finish.

D. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

E. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer adhesive in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

D. Apply overcoat to a thickness of .75 inches.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
   1. Submit field test reports promptly to Contractor and Architect.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. FM (AG) - FM Approval Guide; current edition.

C. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, locations of all rated walls with type of fire stopping system proposed, fire rating of the penetrated assembly, locations of all rated walls with type of fire stopping system proposed, firestopping test or design number, and locations of all rated walls with type of fire stopping system proposed.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Certificate from authority having jurisdiction indicating approval of materials used.

F. Installer Qualification: Submit qualification statements for installing mechanics.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.

1.05 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.

B. If accepted, mock-up may remain and represent minimum standard of the Work. Remove and replace mock-ups not accepted.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Prohibited Materials: Do not use any product that contains asbestos..

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Caulk or putty.

C. Firestopping at Combustible Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.

D. Firestopping at Cable Tray Penetrations: Any material meeting requirements.

E. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Any material meeting requirements.

F. Firestopping at Control Joints (without Penetrations): Any material meeting requirements.

G. Firestopping Between Edge of Floor Slab and Curtain Wall: Fiber firestopping with smoke seal coating.

H. Firestopping Between Top of Partition Wall and Roof Slab: Fiber firestopping with smoke seal coating.

I. Temporary Firestopping: Reusable intumescent shapes.

2.04 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
   1. Color: Dark Grey or Red
   2. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.

C. Foam Firestoppping: Single component silicone foam compound.
   1. Color: Dark Grey or Red.
   2. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti, Inc: www.us.hilti.com.
      c. Specified Technologies, Inc: www.stifirestop.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers.
   1. Color: Dark Grey.
   2. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. USG: www.usg.com.

E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening.
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. Pecora Corporation: www.pecora.com.
      c. Thermafiber, Inc: www.thermafiber.com.

F. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

G. Firestop Devices - Cast-In Type: Sleeve and sealing material, intended to be cast in concrete floor forms or in concrete on metal deck, not requiring any additional materials to achieve penetration seal.
   1. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti, Inc: www.us.hilti.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

H. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 1000 percent.
   2. Color: Red.
   3. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

I. Reusable Firestopping: Removable intumescent compressible shapes, pillows, or blocks specifically tested in removable configuration.
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. Hilti, Inc: www.us.hilti.com.
      c. Nelson FireStop Products: www.nelsonfirestop.com.
      d. Specified Technologies, Inc: www.stifirestop.com.

J. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2006 (Reapproved 2011).

B. ASTM C834 - Standard Specification for Latex Sealants; 2014.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

J. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Sample product warranty.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.04 MOCK UP

A. Provide mock-up of sealant joints in conjunction with wall and air barrier system.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed. Mockup may remain as part of the Work.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
      a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.
      b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
   3. Field testing agency's qualifications.

E. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   3. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   4. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   5. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

F. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
   3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.06 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.

3. Pecora Corporation: www.pecora.com.
4. Sherwin-Williams Company: www.sherwin-williams.com.
5. Sika Corporation: www.usa-sika.com.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
2. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
3. Pecora Corporation: www.pecora.com.
4. Sherwin-Williams Company: www.sherwin-williams.com.
5. Sika Corporation: www.usa-sika.com.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.
c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
a. Joints between door, window, and other frames and adjacent construction.
b. Other joints indicated below.
3. Do not seal the following types of joints.
a. Intentional weepholes in masonry.
b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing; Type H.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing; Type H.
3. Butt Joints in Exterior Metal Work and Siding: Acrylic Emulsion; Type G.
4. Joints between concrete panels and between panels of adjacent work:
5. Joints between masonry and cast stone: Type U with sand.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
4. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.03 NONSAG JOINT SEALANTS

A. Type U-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Cure Type: Single-component, neutral moisture curing.
   6. Service Temperature Range: Minus 20 to 180 degrees F.
   7. Manufacturers:
      a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
      b. Pecora Corporation: www.pecora.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Type U-2 - Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.
   4. Cure Type: Single-component, neutral moisture curing
   5. Service Temperature Range: Minus 65 to 180 degrees F.
   6. Manufacturers:
      a. Dow Chemical Company; DOWSIL 999-A Building and Glazing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
      b. Pecora Corporation: www.pecora.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Type E - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Manufacturers:
      a. Pecora Corporation: www.pecora.com.

D. Type A - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:
      a. Pecora Corporation: www.pecora.com.
      b. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.
      c. BASF Corporation; MasterSeal NP1, One component polyurethane sealant. www.master-builders-solutions.basf.us
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Type J - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:

a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

F. Type B - Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.

G. Type G - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Manufacturers:
a. Pecora Corporation: www.pecora.com.
b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.

H. Type C - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Service Temperature Range: Minus 13 to 180 degrees F.
4. Manufacturers:
a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

I. Type H - Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.
1. Manufacturers:
a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.

2.04 SELF-LEVELING SEALANTS

A. Type F - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Grey.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
a. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
b. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.

B. Type P - Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic. Joint filler for areas to receive polished concrete finish. Confirm material with system manufacturer / installer.
1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
2. Color: To be selected by Architect from manufacturer's standard colors.
3. Joint Width, Maximum: 3/4 inch.

4. Manufacturers:
    a. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: www.ardexamericas.com/#sle.
    b. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
    c. Nox-Crete Inc; DynaFlex JF-85: www.nox-crete.com/#sle.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
    1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
    2. Open Cell: 40 to 50 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

F. Sand: White or tan sand, selection based on field mockup.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

D. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fire-rated hollow metal doors and frames.

B. Accessories, including glazing, louvers, and matching panels.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

I. ASTM E413 - Classification for Rating Sound Insulation; 2022.

J. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

L. ITS (DIR) - Directory of Listed Products; current edition.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

E. Manufacturer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Assa Abloy Ceco, Curries or Flemming; www.assaabloydss.com
   2. Assa Abloy Stiles; www.stilesdoors.com
   3. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled, both sides.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Type F , Exterior Doors: Thermally insulated. Provide fire-rated door construction as indicated for door Type ___ , Fire-Rated Doors and the following exterior door requirements.
   1. Basis of Design: Assa Abloy Stiles
   2. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 3 - Stile and Rail.
d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum, not less than level specified.

3. Core Material: Polystyrene, 1 lbs/cu ft minimum density.
4. Door Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate. U-Value of 0.50 minimum.
5. Door Thickness: 1-3/4 inch, nominal.
6. Weatherstripping: Refer to Section 08 7100.

B. Type FF , Fire-Rated Doors:
1. Basis of Design Assa Abloy RITE Integrated Metal Doors
2. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level 2 - Heavy-duty.
b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum, not less than level specified.
3. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
b. Attach fire rating label to each fire rated unit.
4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
5. Door Thickness: 1-3/4 inch, nominal.
6. Hardware: D3682 Inset push x flush pull. Provide all other required hardware to complete installation.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Fully welded.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
3. Weatherstripping: Separate, see Section 08 7100.

D. Door Frames, Fire-Rated: Fully welded type.
1. Fire Rating: Same as door, labeled.
2. For RITE Doors provide frame as drawn. See drawings.

E. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

F. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

G. Frame width to extend past face of wall or partition on either sides, unless noted or detailed otherwise.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 08 8000.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7100.
   1. Exterior Doors: Steel, Z-shaped.
   2. Fire-Rated Doors: Steel, shape as required for fire rating.

D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 7100.

F. Comply with glazing installation requirements of Section 08 8000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

Section 08 14 23
ALUMINUM CLAD DOORS

Part 1 General

1.1 Section Includes

A. Ultimate Commercial Door and Frame, complete with hardware, glazing, weather strip, simulated divided lite, stationary sidelite, stationary transom, jamb extension, and standard or specified anchors, trim, and attachments.

1.2 Construction Specification Institute (CSI) MasterFormat Numbers and Titles

A. Section 01 33 00 – Submittal Procedures: Shop Drawings, Product Data, and Samples

B. Section 01 62 00 – Product Options

C. Section 01 63 00 – Product Substitution Procedures

D. Section 01 65 00 – Product Delivery

E. Section 01 66 00 – Product Storage and Handling Requirements

F. Section 01 71 00 – Examination and Preparation

G. Section 01 73 00 - Execution

H. Section 01 74 00 – Cleaning and Waste Management

I. Section 01 75 00 – Starting and Adjusting

J. Section 01 76 00 – Protecting Installed Construction

K. Section 06 22 00 – Millwork: Wood trim other than furnished by door and frame manufacturer

L. Section 07 92 00 – Joint Sealants: Sill sealant and perimeter caulking

M. Section 08 71 00 – Door Hardware: Hardware other than furnished by door and frame manufacturer

N. Section 09 90 00 – Paints and Coatings: Paint or stain other than factory applied finish

1.3 References

A. WDMA I.S.4: Industry Standard for Water Repellent Preservative Treatment Millwork

B. Sealed Insulating Glass Manufacturers Association / Insulating Glass Certification Council (SIGMA/IGCC)

C. American Architectural Manufacturers Association (AAMA): 2605: Voluntary Specification for High-Performance Organic Coatings on Architectural Extrusions and Panels.

D. American Society for Testing and Materials (ASTM):

1. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1. E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights

1.4 System Description

A. Design and Performance Requirement. Design Pressure applies to individual units and may vary with unit size. (2 ¼" Door only)

1. Units shall be designed to comply with ASTM E330 for structural performance. SHED DP +40/-40 psf (with removable mullion rim device & vertical locking rods) and SHED DP +25/-25 psf (with removable mullion and rim device)

1.5 Submittals

A. Shop Drawings: Submit shop drawings under the provision of CSI MasterFormat Section 01 33 00.

B. Product Data: Submit product data for certified options under provision of CSI MasterFormat Section 01 33 00. Product performance rating information may be provided via quote, performance rating summary (NFRC Data), or certified performance grade summary (WDMA Hallmark data).

C. Samples:
1. Submit corner section under provision of CSI MasterFormat Section 01 33 00.
2. Specified performance and design requirements under provisions of CSI MasterFormat Section 01 33 00.

1.6 Quality Assurance

A. Requirements: consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions

1.7 Delivery

A. Comply with provisions of CSI MasterFormat Section 01 65 00

B. Deliver in original and protect from weather

1.8 Storage and Handling

A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation

B. Store door panels flat on a level surface in a clean and dry storage area above ground to protect from the weather under the provision of Section 01660

C. Condition doors to local average humidity before hanging

1.9 Warranty

Complete and current warranty information is available at **marvin.com/warranty**. The following summary is subject to the terms, conditions, limitations, and exclusions set forth in the Marvin Limited Warranty and Products in Coastal Environments Limited Warranty Supplement:

A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from (10) years from the original date of purchase.

B. Standard exterior aluminum cladding finish is warranted against manufacturing defects resulting in chalk, fade, and loss of adhesion (peel) per the American Manufacture's Association's (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of purchase.

C. Factory applied interior finish is warranted to be free from the Finish Defects for a period of five (5) years from the original date of purchase.

D. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

Part 2 Products

2.1 Manufactured Units

A. Description: Factory assembled Ultimate Commercial Door, manufactured by Marvin, Ripley, Tennessee.

2.2 Frame Description

A. Finger-Jointed, edge-glued Pine core with non-finger-jointed Pine veneer;

1. Kiln dried to moisture content no greater than twelve (12) percent at the time of fabrication

2. Water repellent, preservative-treated in accordance with WDMA I.S.4.

B. Frame width: 4 9/16" (116mm)

C. Frame thickness: 1 1/16” (27mm)

D. Exterior extruded aluminum clad 0.050” (1.3mm) thick

E. Sill Options: Architect to pick from standard options. Reference drawings.

2.3 Panel Description

A. 2 ¼” Doors: Stiles and top rail contain laminated veneer lumber (LVL) core with non-finger-jointed Pine, White Oak, Cherry, Mahogany, Mixed Grain Douglas Fir. Solid wood bottom and intermediate rails.

B. Composite panel thickness: 2 ¼” (57mm)

C. Exterior extruded aluminum clad 0.055” (1.4mm) thick

D. Top rail width: 2 ¼” panel: 8 1/8” (206mm)

E. Stile width: 6” (152mm)

F. Bottom rail height: 11 3/8” (289mm)

G. Panel corners glued and fastened with 5/8” x 4” (16mm x 102mm) fluted hardwood dowels. Removable interior vinyl glazing stops with non-finger-jointed wood covers. panel: no visible fastener holes; 2 ¼” panel: visible nail fastener on glazing stop.

2.4 Glazing

A. Select quality complying with ASTM C1036. Comply with 16 CFR 1201 Safety Standard for Architectural Glazing Materials. Tempered insulating glass IGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E774.

B. Glazing Method: Tempered Insulating Glass

C. Dual Pane thickness: 15/16”

D. Glass fill: Air with capillary tubes, Argon

E. Glass Type: Clear, Low E3 Argon

F. Glazing Seal: Silicone bedding, exterior

2.5 Finish

A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat over a primer. Meets AAMA 2605 requirements.

B. Standard Colors TBD by Architect: Interior Finish Options:

1. Painted Interior Finish. White Meets WDMA TM-14 requirements.

2.6 Hardware

A. Hinges: 4 ½” x 4 ½” square corner ball bearing hinges.

1. Finish: Satin Chrome (US26D) over the brass substrate, Bronze (US10A) over the brass substrate, Brass (US3), Stainless Steel (US32D).

B. Locking System: Reference Hardware Schedule

1. No lock no bore is standard

2. Optional Commercial Hardware Package: closer, rim device, mortise lock, removable mullion, and kick plate. Reference hardware schedule.

C. Optional hardware Routs and Preps. Reference Hardware Schedule

1. Von Duprin Push pad Rim Devices and Trim Sets

2. Von Duprin Cross Bar Device and Trim Sets

3. Von Duprin 5547 Concealed Vertical Rod Exit Device (available with 2 ¼” panels only)

4. Schlage L Mortise Lock and Trim Sets

5. Schlage ND Cylindrical locks

6. Sargent 8200 Mortise Lock

7. Alarm Lock

2.7 Weather Strip

A. Head jamb and hinge jamb: bulb type weather strip.

1. Color: Beige or optional black

B. Locking jamb: Gray pile weather strip

C. Surface-mounted aluminum panel drip mounted at the bottom of the panel (shipped loose for field application)

1. Standard colors: Matches panel finish with matching screws

2. Custom colors: Matches panel finish with stainless steel screws

2.8 Jamb Extension

A. Factory installed (loose) for wall thickness indicated or required.

B. Finish: Match interior frame wood species and finish.

2.9 Simulated Divided Lites (SDL)

A. 7/8” (22mm),– with internal spacer bar.

1. Exterior muntins: Extruded aluminum 0.055” (1.4mm) thick. Color-matched panel aluminum cladding color.
2. Interior muntins: Wood and finish interior of door
3. Pattern: Rectangular
4. Interior muntins: Wood and finish interior of door
5. Standard interior glazing profile: Ogee

2.10 Accessories and Trim

A. Installation and hardware Accessories:

1. Factory installed vinyl nailing fin/drip cap
2. Installation brackets: 6 3/8” (162mm); 9 3/8” (238mm); 15 3/8” (390mm)
3. Masonry brackets: 6” (152mm); 10” (254mm)

B. Aluminum Extrusions:

1. Profile:
2. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets AAMA 2605 requirements. Available in all aluminum clad colors. Contact your Marvin representative for custom colors.

Part 3 Execution

3.1 Examination

A. Verification of Condition: Before installation, verify openings are plumb, square, and of proper dimensions, as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General contractor before proceeding.

B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

3.2 Installation

A. Comply with Section 01 73 19.

B. Assemble and install window/door unit(s) according to manufacturer’s instruction and review shop drawing.

C. Install sealant and related backing materials at the perimeter of the unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.

D. Install accessory items as required.

E. Use finish nails to apply wood trim and mouldings.

3.3 Field Quality Control

A. Remove visible labels and adhesive residue according to the manufacturer’s instructions.

3.4 Cleaning

A. Remove visible labels and adhesive residue according to the manufacturer’s instructions.

B. Leave windows and glass in a clean condition—final cleaning as required in CSI MasterFormat Section 01 74 00.

3.5 Protecting Installed Construction

A. Comply with CSI MasterFormat Section 01 76 00.

B. Protecting windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

End of Section

SECTION 08 1433
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; non-fire rated.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry: Wood door frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

D. Section 09 9123 - Interior Painting: Field finishing.

E. Section 09 9300 - Staining and Transparent Finishing: Field finishing.

1.03 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Specimen warranty.

D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required , special beveling , special blocking for hardware , factory machining criteria , factory finishing criteria , identify cutouts for glazing, louvers, and _____.

E. Samples: Submit two samples of door construction, ____x____ inch in size cut from top corner of door.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. This project has been registered as AWI/QCP project number _____.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   6. Arrange and pay for inspections required for certification.
   7. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver, and store doors in accordance with quality standard specified.

B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and _____.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Custom.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints; water repellent treated. Transparent finish as indicated on drawings.

C. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.

2.03 DOOR AND PANEL FACINGS

A. Veneer Facing for Transparent Finish: Natural Birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

B. Interior Doors: Wood veneer, _____ species, plain sliced, with book matched grain, for paint finish.

C. Adhesive: Type I - Waterproof.

2.04 COMPONENTS

A. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. Glazing: Single vision units, 1/4 inch thick panes of glass.
   3. Tint: Clear.

2.05 DOOR CONSTRUCTION

A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.

B. Fit door edge trim to edge of stiles after applying veneer facing.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory install glazing in doors in compliance with quality standards specified, using manufacturer's standard elastomeric glazing sealant.

E. Cut and configure exterior door edge to receive recessed weatherstripping devices. Provide edge clearances in accordance with referenced quality standards.

2.06 FACTORY FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
   2. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.

b. Color: As selected by Architect.
c. Sheen: Flat.

2.07 ACCESSORIES

A. Wood Door Frames: As specified in Section 06 2000.

B. Glazed Openings:
   1. Glazing: Single vision units, 1/4 inch thick panes of glass.

C. Glazing: As specified in Section 08 8000.

D. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standards.

B. Machine cut for hardware.

C. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Conform to specified quality standard for fit, clearance, and joinery tolerances.

B. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inch surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 1600
COMPOSITE DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom Carved Composite Doors

1.02 REFERENCE STANDARDS

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

C. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI Z97.1: Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test

B. National Fire Protection Association (NFPA)
   1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.

C. Underwriters Laboratories, Inc. (UL)
   1. UL 10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure testing standard)
   2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.

D. Uniform Building Code Standard 7-2 (UBC)
   1. UBC 7-2 (1994): Fire Tests of Door Assemblies. (Note: Neutral pressure testing standard).
   2. UBC 7-2 (1997): Fire Test of Door Assemblies. (Note: Positive pressure testing standard).

1.04 DESIGN REQUIREMENTS

A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with NFPA 252, UL 10B & C,and UBC 7-2.

1.05 ACTION SUBMITTALS

A. Refer to Section 01 3000 Submittal Procedures.

B. Product Data: Submit door manufacturer current product literature, including installation instruction.

C. Samples: Provide finish samples for all products.

D. Quality Assurance Submittals
   1. Manufacturer Instructions: Provide manufacturer’s written installation

1.06 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 6000 Product Requirements

B. Deliver doors, materials and components in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Store doors as recommended by manufacturer.

1.07 WARRANTY

A. Refer to Section 01 7800 Close Out Submittals.

B. Manufacturer standard warranty indicating that the door will be free from material and workmanship defects from the date of substantial completion for the time periods indicated below:
   1. Door Unit: 5 years

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Doors are based on MASONITE Molded Panel Series Particleboard Core Interior Doors.

2.02 DOORS

A. Door Design
   1. Surface Finish: Smooth
   2. Panels and Sticking Profile:
      a. Two panels: Flat Panel with OG sticking.

B. Core and Frame
   1. Solid core with combination wood/MDF or all-wood frame.
      a. Thickness: 1-3/4 inch with 20-minute fire rating & non-rated.
   2. Jambs
      a. Jamb Width: as required by wall thickness.
      b. Jamb Type: Split
      c. Jamb Species: Finger-Jointed Pine

C. Hardware
   1. Finish: Brushed Chrome

D. Finish: Preprimed
   1. Color: To be selected by architect.

PART 3 EXECUTION

3.01 GENERAL

A. Install doors in accordance with manufacturer’s installation guidelines and recommendations.

3.02 EXAMINATION

A. Inspect door prior to installation.

B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.03 PREPARATION

A. Prepare door for installation in accordance with manufacturer’s recommendations.

3.04 CUSTOM CARVED COMPOSITE DOOR INSTALLATION

A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.

B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.

C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.

D. Shim top of jamb in center of opening and fasten with nail.

E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.

F. Set nails.

G. Install trim on both sides using nails every 12 to 16 inches

3.05 SCHEDULE

A. See drawings for scheduled sizes and details.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Wall mounted access units.

B. Ceiling mounted access units.

1.02 RELATED REQUIREMENTS

A. See Fire Protection, Plumbing, Mechanical, Electrical, and other associated trades for components located above hard lid ceilings and within walls that may require access panels to reach them. Locations may not be visually shown on drawings but where device is installed and concealed an access panels must be provided. It is encouraged to locate device, valve, etc. in location accessible to avoid installation of access panel. GC responsible to coordinate panel locations among trades to reduce quantity and verify acceptiblity with Architect.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Panel Material: Steel.
   2. Size: 12 inch by 12 inch, minimum or as required to permit access. Coordinate size with other trades access panel is used for.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size: 12 inch by 12 inch., minimum or as required to permit access. Coordinate size with other trades access panel is used for.

C. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size: 12 inch by 12 inch., minimum, or as required to permit access. Coordinate size with other trades access panel is used for.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
   2. Cendrex, Inc: www.cendrex.com/#sle.
   3. J.L. Industries Inc: www.activarcpg.com/jl-industries
   4. Milcor, Inc: www.milcorinc.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Style: Frame concealed by door panel.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Frames: 16 gage, 0.0598 inch, minimum thickness.
   5. Single Steel Sheet Door Panels: 1/16 inch, minimum thickness.
   6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
      a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
      b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
   7. Steel Finish: Primed.
   8. Primed and Factory Finish: Polyester powder coat; color manufacturer's standard.
   9. Hardware:
      a. Hardware for Fire-Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Drawings do not show all access panels and Contractor is responsible to provide all access panels as required for a complete installation.

C. Coordinate installation locations with other trades (Mechanical, Electrical, etc.) to ensure proper size is provided to allow access to items beyond access panel. Adjust size as necessary to accomodate access. Locate and install additional access panels as needed.

D. Locate devices that require access above lay-in acoustical ceilings when possible. Provide access panel where necessary when behind gypsum board walls / ceilings.

E. Install frames plumb and level in openings, and secure units rigidly in place.

F. Position units to provide convenient access to concealed equipment when necessary.

G. Field paint access panels where necessary to match adjacent finishes.

END OF SECTION

SECTION 08 3313
COILING COUNTER DOORS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Electric motor operation; wiring from electric circuit disconnect to operator to control station.

1.02 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NEMA MG 00001 - Motors and Generators; 2024.

E. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

E. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.04 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. The Cookson Company, Inc.; Model ESC10 ; www.cooksondoor.com.
   2. The Overhead Door Company, Inc.; Model 652; www.overheaddoor.com
   3. McKeon; Model CS3000; www.mckeon.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Interior face mounted.
   2. Nominal Slat Size: 1-1/4 inches wide.
   3. Slat Profile: Flat.
   4. Finish, Aluminum: RAL Color Powder Coat to match wall color. Provide color chips for Architect's review prior to ordering.
   5. Guides: Formed track; same material and finish unless otherwise indicated.
   6. Hood Enclosure: Manufacturer's standard; Powder Coat Aluminum.
   7. Electric operation.

2.03 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction (AHJ) as suitable for purpose specified and indicated.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure: NEMA MG 00001.
   3. Motor Rating: As recommended by manufacturer; continuous duty.
   4. Motor Voltage: 110-120 VAC, single phase, 60 Hz. Verify with Manufacturer.
   5. Opening Speed: 6 inches per second.
   6. Manual override in case of power failure.
   7.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each electrical operator.
   1. Controls: 24 VAC circuit.
   2. Surface mounted.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 0583.

F. Complete wiring from disconnect to unit components.

3.02 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.03 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 4435
PROTECTIVE FRAMED GLAZING ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior protective framed glazing assembly.

1.02 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

D. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

G. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Test Reports: Submit results of full-size mock-up testing for criteria other than fire performance. Reports of tests previously performed on the same design are acceptable.

C. Field Quality Control Submittals: Submit report of field testing for water leakage.

D. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

1.06 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide mock-up that includes components of the types specified, and assemble to illustrate complete assembly, including attachments, anchors, and perimeter sealant.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F, and maintain above this minimum temperature during and for 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

PART 2 PRODUCTS

2.01 INTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

A. Manufacturers:

1. McGrory Glass, Inc; forster fuego light Steel Fire-Rated Framing System by McGrory Glass: www.mcgrory.com/#sle.
2. SAFTIFIRST, a division of O'Keeffe's Inc; GPX Architectural Series with temperature rise doors: www.safti.com/#sle.
3. Vetrotech North America; VDS 60 with VDS Doors: www.vetrotechusa.com/#sle.
4. _____.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.

C. Structural Performance: Design to support dead loads and horizontal live loads equivalent to the following; coordinate connection to main structural members.
1. Design Live Loads: Comply with requirements of the following:
a. Positive Design Live Load: ____ lbf/sq ft.
b. Negative Design Live Load: ____ lbf/sq ft.
c. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design loads and 10 second duration of maximum pressure.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths or 3/4 inch, whichever is less, under specified design load.

D. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with ASTM E119 or UL 263 and requirements of local authorities having jurisdiction.
1. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive work of this section; see Section 07 2500 for additional information.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch every 3 feet non-cumulative or 1/2 inch per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of manufacturer's field representative to observe installation and submit report.

B. See Section 01 4000 - Quality Requirements for independent testing and inspection requirements; inspection will monitor quality of installation and glazing.

3.05 ADJUSTING

A. Adjust doors for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5200
WOOD WINDOWS

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Basis of Design: Marvin Ultimate Single Hung and Marvin Ultimate Casement.

B. Aluminum Clad Wood Windows:
   1. Marvin Ultimate.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Aluminum Clad Matching Patio Doors:

1.02 WOOD WINDOWS

A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
   1. Configuration: As indicated on drawings.

1.03 COMPONENTS

A. Glazing: Double glazed, clear, Low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.

B. Frames: ____ inch wide by ____ inch deep profile; flush solid wood glass stops of screw fastened type, sloped for positive drainage.

C. Sills: Extruded aluminum, with ____ inch nominal thickness; sloped for positive drainage; fits under sash and projects at least 1/2 inch beyond exterior face of wall; single piece full width of opening.

D. Fasteners: Stainless steel.

E. Flashing: Provide related flashings, with necessary anchors and attachment devices.

END OF SECTION

SECTION 08 5213
ALUMINUM CLAD CASEMENT WINDOWS

Part 1 General

1.1 Section Includes

Ultimate Casement/Awning Crank Out: Operators, Stationary, and Picture units complete with hardware, glazing, weather strip, simulated divided lite, jamb extension, and standard or specified anchors, trim, and attachments

1.2 Construction Specification Institute (CSI) MasterFormat Numbers and Titles

A. Section 01 33 00 – Submittal Procedures; Shop Drawings, Product Data, and Samples
B. Section 01 62 00 – Product Options
C. Section 01 65 00 – Product Delivery
D. Section 01 66 00 – Storage and Handling Requirements
E. Section 01 71 00 – Examination and Preparation
F. Section 01 73 00 - Execution

Section 01 74 00 – Cleaning and Waste Management
Section 01 76 00 – Protecting Installed Construction
Section 06 22 00 – Millwork: Wood trim other than furnished by the window manufacturer
Section 07 92 00 – Joint Sealant: Sill sealant and perimeter caulking
Section 09 90 00 – Painting and Coatings: Paint and stain other than factory applied finish

1.3 References

A. American Society for Testing Materials (ASTM):
E283: Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors
E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Door by Uniform Static Air Pressure Difference
E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential
E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights
E2190: Specification for Sealed Insulated Glass Units
C1036: Standard Specification for Flat Glass
F2090: Standard Specifications for Windows Fall Prevention Devices with Emergency Escape (egress) Release Mechanisms

B. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association (AAMA/WDMA/CSA):
1. AAMA/WDMA/CSA 101/I.S.2/A440-05 Standard/Specification for Window, Skylights, and Doors
2. AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights
3. AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS 2011 – Northern American Fenestration Standard/Specification for Windows, Doors, and Skylights

C. WDMA I.S.4: Industry Standard for Water Repellant Preservative Treatment for Millwork
D. Window and Door Manufacturer's Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program
E. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification Council (SIGMA/IGCC)
F. American Architectural Manufacturer's Association (AAMA): 2605: Voluntary Specification for High-Performance Organic Coatings on Architectural Extrusions and Panels
G. National Fenestration Rating Council (NFRC):

1. 101: Procedure for Determining Fenestration Product thermal Properties
200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence

1.4 Submittals

A. Shop Drawings: Submit shop drawings under the provision of CSI MasterFormat Section 01 33 00.

B. Product Data: Submit product data for certified options under provision of CSI MasterFormat Section 01 33 00. Product performance rating information may be provided via quote, performance rating summary (NFRC Data), or certified performance grade summary (WDMA Hallmark data).

C. Samples:
1. Submit corner section under provision of CSI MasterFormat Section 01 33 00.
2. Specified performance and design requirements under provisions of CSI MasterFormat Section 01 33 00.

1.5 Quality Assurance

A. Requirements: consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions for information on:
   1. Egress, emergency escape, and rescue requirements
   2. Basement window requirements
   3. Windows fall prevention and/or window opening control device requirements

1.6 Delivery

A. Comply with provisions of CSI MasterFormat Section 01 65 00
B. Deliver in original packaging and protect from weather

1.7 Storage and Handling

A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation
B. Store window units in an upright position in a clean and dry storage area above ground to protect from the weather under the provision of CSI MasterFormat Section 01660

1.8 Warranty

Complete and current warranty information is available at marvin.com/warranty. The following summary is subject to the terms, conditions, limitations, and exclusions set forth in the Marvin Windows and Door Limited Warranty and Products in Coastal Environments Limited Warranty Supplement:

A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
B. Standard exterior aluminum cladding finish is warranted against manufacturing defects resulting in chalk, fade, and loss of adhesion (peel) per the American Architectural Manufacturer's Association (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of purchase.
C. Factory-applied interior finish is warranted to be free from finish defects for a period of five (5) years from the original date of purchase.
D. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

Part 2 Products

2.1 Manufactured Units

A. Description: Factory-assembled Ultimate Casement/Awning, operating exterior swing window on Casement and a top pivoting awning (stationary or picture units) manufactured by Marvin Windows and Doors, Warroad, Minnesota.

2.2 Frame Description

A. Interior: Non-Finger-Jointed Pine or finger-jointed core with non-finger-jointed Pine veneer;
   1. Kiln-dried to moisture content no greater than twelve (12) percent at the time of fabrication Water repellant preservative treated in accordance with WDMA I.S.4.
B. Frame exterior aluminum clad with 0.050 inches (1.3mm) thick extruded aluminum
C. Frame thickness: 1 3/16" (30mm)
D. Frame depths for full-frame units have an overall 5 21/32" jamb (144mm). 4 9/16" (116mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.
E. Frame bevel: Standard is no bevel; optional available are 8 degrees and 14 degrees bevel (Narrow Frame frame only)
F. In-Sash Casement Polygon: minimum frame angle15°, minimum short leg of Rough Opening 6" (152mm)

2.3 Sash Description

A. Interior: Non-Finger-Jointed Pine or finger-jointed core with non-finger-jointed Pine veneer;
    1. Kiln-dried to moisture content no greater than twelve (12) percent at the time of fabrication
    2. Water repellant preservative treated in accordance with WDMA I.S.4
B. Sash exterior aluminum clad with 0.050” (1.3mm) thick extruded aluminum
C. Sash thickness: 1 5/8” (41mm) and 1 7/8” (48mm) for full-frame units.
D. Stiles and Rails: 2 1/16” (52mm)
E. Glazing Profiles:
    1. Interior Glazing Profile:
        a. Standard: Ogee
    2. Exterior Glazing Profile:
        a. Standard: Putty

2.4 Glazing

Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 2190

Glazing method: Insulating glass

Glazing seal: Silicone bedding at interior and exterior

Insulating glass will be altitude adjusted with capillary tubes for higher elevations. Argon gas is not available for elevations that require capillary tubes

Dual-pane thickness: 3/4”

Glass fill: Air with capillary tubes, Argon.

Glass Type: Clear, Tempered where required by code, Low E3 with argon,

2.5 Finish

A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat over a primer. Meets or exceeds AAMA 2605 requirements.
    1. Aluminum clad color options TBD by Architect: Bahama Brown, Bronze, Cadet Gray, Cascade Blue, Cashmere, Clay, Coconut Cream, Ebony, Evergreen, Gunmetal, Hampton Sage, Pebble Gray, Sierra White, Stone White, Suede, Wineberry, Bright Silver (pearlescent), Copper (pearlescent), Liberty Bronze (pearlescent)
B. Interior Finish options:
    1. Painted Interior Finish. Factory-applied water-borne acrylic enamel. Available on Pine product only. Available in White or Designer Black. Meets WDMA TM-14 requirements.

2.6 Hardware

A. Casement operating hardware:
    1. Locks: Multi-point sequential concealed locking system in the jamb opposite the hinge side for casement units. Lock handles are removable, non-handed, and are available in the same finishes as the handles. Standard tie bars, cams, and keepers – steel coated with E-Gard ™. The keeper features a roller to reduce average lock force and does not easily disengage with the cam even under severe loading. Stainless steel packages are available for coastal applications.
    2. Handles: Standard operating handle is a folding handle, zinc painted with the standard folding cover being molded plastic. Available colors: standard is Satin Taupe (painted), White (painted), Bronze (painted), Matte Black (painted), Satin Chrome (plated), Satin Nickel (plated), Oil Rubbed Bronze (plated), Brass (plated), Antique Brass (plated)

3. Hinges: One at the sill to the bottom rail and the head jamb to the top rail. Hinges are steel coated with E-Gard™. The hinge track is stainless steel. Unit with a frame OM of 20 inches (508mm) and greater use an 18-inch (457mm) wash/egress hinge to allow the sash to slide across the frame opening, which causes the sash exterior to rotate towards the user for easy washability. Units under a frame OM of 20 inches (508 mm) width use a standard 2 bar hinge, which will position the sash when fully open to 90degrees for the user to wash but does not include the feature of sliding the sash across the opening and rotating the exterior towards the user.
4. Optional Factory Installed Window Opening Control Device (WOCD): The standard operation of the WOCD limits the operation of the sash to an opening of less than 4" (102mm). The sash arm detaches from the lock housing by a two-step function actuation to allow the normal operation of the unit. The WOCD re-engages when the unit is fully closed. WOCD is Coastal-compliant. Hardware meets ASTM F2090-17.
    a. Minimum frame OSM 20" (508mm) x 19 1/8" (486mm);
    b. Maximum frame
        i. 44" (1118mm) width
        ii. If the width is greater than 36" (914mm) or less than 44" (1118), then 92" (2337mm) maximum height
        iii. If the width is less than or equal to 36" (914), then 96 1/8" (2442mm).
    c. The WOCD hardware is handed. The Lock Housing and Sash Arm are comprised of multiple stainless steel, injection molded components, and a single stainless-steel spring. The Lock Housing fits within a pocket of the jamb. The Sash Arm will fit within a pocket between the jamb/sill cover and the locking hardware.

B. Weather Strip

A. Weather strip at the frame is a hollow-foamed material bent around a 90-degree corner to allow for seamless corner joints
    1. Color: Beige

B. Sash weather strip bulb-shaped glass-filled material
    1. Color: White, beige, or black

2.7 Jamb Extension

A. Jamb extensions are available for various wall thickness factory-applied up to a 12 (305mm) wide
B. Finish: Match interior frame finish

2.8 Insect Screen

A. Crank Out
    1. Aluminum frame finish is available in Satin, Bronze, Stone White, or Ebony
    2. Screen Frame
        a. Window Frame Height less than or equal to 54 ½" Aluminum Screen Frame. Option: Extruded Aluminum Screen Frame
        b. Window Frame Height greater than 54 ½" Extruded Screen Frame. Option: None.
    3. Screen mesh: Standard is Marvin Bright View™. Optional Charcoal Aluminum Wire, Black Aluminum Wire, Bright Bronze Aluminum Wire, Bright Aluminum Wire
    4. Optional Wood Screen Surround with Marvin Bright View™. Species will match unit species

2.9 Simulated Divided Lites (SDL)

A. 7/8" (22mm) wide, wide with internal spacer bar
B. Exterior muntins: 0.055" (1.4mm) thick extruded aluminum
C. Interior muntins: Pine
D. Muntins adhere to glass with closed-cell copolymer acrylic foam tape

E. SDL Profiles:
   1. Interior SDL Profile:
      a. Standard: Ogee
   Exterior SDL Profile:
      b. Standard: Putty
F. Patterns: Rectangular
G. Finish – exterior matches exterior aluminum clad colors, interior matches' interior wood species and color

2.10 Accessories and Trim

A. Installation Accessories:
   1. Factory-installed vinyl nailing/drip cap
B. Aluminum Extrusions:
   1. Profile: 1 5/16" Clad Brickmold casing
   2. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2605 requirements.
   3. Available in all exterior aluminum clad colors

Part 3 Execution

3.1 Examination

A. Verification of Condition: Before installation, verify openings are plumb, square, and of proper dimensions, as required in CSI MasterFormat Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

3.2 Installation

A. Comply with CSI MasterFormat Section 01 73 00.
B. Assemble and install window/door unit(s) according to manufacturer's instruction and review shop drawing.
C. Install sealant and related backing materials at the perimeter of the unit or assembly in accordance with CSI MasterFormat Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
D. Install accessory items as required.
E. Use finish nails to apply wood trim and mouldings.

3.3 Field Quality Control

A. Remove visible labels and adhesive residue according to the manufacturer's instructions.
B. Unless otherwise specified, air leakage resistance tests shall be conducted at a uniform static pressure of 75 Pa (~1.57 psf). The maximum allowable rate of air leakage shall not exceed 2.3 L/sm^2 (~0.45 cfm/ft^2).
C. Unless otherwise specified, water penetration resistance testing shall be conducted per AAMA 502 and ASTM E1105 at 2/3 of the fenestration products design pressure (DP) rating using "Procedure B" – cyclic static air pressure difference. Water penetration shall be defined in accordance with the test method(s) applied.

3.4 Cleaning

A. Remove visible labels and adhesive residue according to the manufacturer's instructions.
B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

3.5 Protecting Installed Construction

A. Comply with CSI MasterFormat Section 07 76 00.
B. Protecting windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

End of Section

Section 08 52 13
ALUMINUM CLAD DOUBLE HUNG WINDOWS

Part 1 General

1.1 Section Includes

A. Ultimate Single Hung G2, Transom, Picture window complete with hardware, glazing, certified mulls, weather strip, insect screen, simulated divided lite, jamb extension, and standard or specified anchors, trim, attachments, factory-applied historic casing(s) and accessories

1.2 Related Sections

A. Section 01 33 00 – Submittal Procedures; Shop Drawings, Product Data and Samples

B. Section 01 62 00 – Product Options

C. Section 01 65 00 – Product Delivery

D. Section 01 66 00 – Storage and Handling Requirements

E. Section 01 71 00 – Examination and Preparation

F. Section 01 73 00 - Execution

G. Section 01 74 00 – Cleaning and Waste Management

H. Section 01 76 00 – Protecting Installed Construction

I. Section 06 22 00 – Millwork: Wood trim other than furnished by window manufacturer

J. Section 07 92 00 – Joint Sealant: Sill sealant and perimeter caulking

K. Section 09 90 00 – Painting and Coasting: Paint and stain other than factory-applied finish

1.3 References

A. American Society for Testing Materials (ASTM):

1. E283: Standard Test method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors

2. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference

3. E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential

E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights
E2190: Specification for Sealed Insulated Glass Units
C1036: Standard Specification for Flat Glass

E2068: Standard Test Method for Determination of Operating Force of Sliding Windows and Doors
E 1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes

4. E 1886: Standard Test method for Performance of Exterior Windows, curtain Walls, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

5. F 2090-17: Standard Specifications for Windows Fall Prevention Devices with Emergency Escape (egress) Release Mechanisms

B. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association (AAMA/WDMA/CSA):

6. AAMA/WDMA/CSA 101/I.S.2/A440-08, Standard/Specification for windows, doors and skylights

7. AAMA/WDMA/CSA 101/I.S.2/A440-11, Standard/Specification for windows, doors and skylights

8. AAMA 450-10, Voluntary Performance Rating Method for Mulled Fenestration Assemblies

C. WDMA I.S.4: Industry Standard for Water Repellant Preservative Treatment for Millwork

D. Window and Door Manufacturer's Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program

E. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification Council (SIGMA/IGCC)

F. American Architectural Manufacturer's Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels

G. National Fenestration Rating Council (NFRC):

9. 101: Procedure for Determining Fenestration Product thermal Properties

10. 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence

H. Window Covering Manufacturer's Association

11. A100.1: American National Standard for Safety of Corded Window Coverings Products

1.5 Submittals

A. Shop Drawings: Submit shop drawings under provision of Section 01 33 00.

B. Product Data: Submit production data for certified options under provision of CSI MasterFormat Section 01 33 00. Product performance rating information may be provided via quote, performance rating summary (NFRC Data), or certified performance grade summary (WDMA Hallmark data).

C. Samples:

12. Submit corner section under provision of section 01 33 00.

13. Specified performance and design requirements under provisions of CSI MasterFormat Section 01 33 00.

1.6 Quality Assurance

A. Requirements: consult local code for IBC [International Building Code] and IRC [International Residential Code] adoption year and pertinent revisions for information on:

14. Egress, emergency escape and rescue requirements

15. Basement window requirements

16. Windows fall prevention and/or window opening control device requirements

1.7 Delivery

A. Comply with provisions of Section 01 65 00

B. Deliver in original packaging and protect from weather

1.8 Storage and Handling

A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation

B. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 66 00

1.9 Warranty

Complete and current warranty information is available at marvin.com/warranty. The following summary is subject to the terms, condition, limitations and exclusions set forth in the Marvin Windows and Door Limited Warranty and Products in Coastal Environments Limited Warranty Supplement:

A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.

B. Standard exterior aluminum cladding finish is warranted against manufacturing defects resulting in chalk, fade and loss of adhesion (peel) per the American Architectural Manufacturer's Association (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of purchase.

C. Factory-applied interior finish is warranted to be free from finish defects for a period of five (5) years from the original date of purchase.

D. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

Part 2 Products

2.1 Manufactured Units

A. Description: Ultimate Single Hung G2 (and related stationary units) as manufactured by Marvin, Warroad, Minnesota.

2.2 Frame Description

A. Interior: Non Finger-Jointed Pine or finger-jointed core with non finger-jointed Pine veneer;

17. Kiln-dried to moisture content no greater than 12 percent at the time of fabrication

18. Water repellant, preservative treated in accordance with ANSI/WDMA I.S.4.

B. Frame exterior aluminum clad with 0.050" (1.3mm) thick extruded aluminum

C. Frame thickness: 11/16" (17mm) head and jambs

D. Frame depth: Frame depth had an overall 5 21/32" jamb (144mm). 4 9/16" (116mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.

E. Sill assembly including the sill liner: 2 7/32" (56mm)

F. Factory-applied 1 5/16" Clad Brickmould Casing

2.3 Sash Description

A. Interior: Non Finger-Jointed Pine or finger-jointed core with non finger-jointed Pine veneer;

19. Kiln-dried to moisture content no greater than 12 percent at the time of fabrication

20. Water repellant preservative treated with accordance with WDMA I.S.4.

B. Sash exterior aluminum clad with 0.050” (1.3mm) thick extruded aluminum

C. Sash thickness: 1 3/4” (44mm). Corner slot and tenoned.

D. Sash Options:

a. Standard: Equal Sash

E. Exterior Cope Profile: Putty

F. Interior Sash Sticking

21. Standard: Ogee

2.4 Glazing

A. Select quality complying with ASTM C1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E2190.

B. Glazing method: Insulating glass

C. Glazing seal: Silicone bedding on interior and exterior

D. Glass fill: Air with capillary tubes, Argon

E. Glass Type: Clear, Tempered where required, Obscure, , Low E3 with Argon

2.5 Finish

A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat over a primer. Meets AAMA 2605 requirements.

22. Aluminum clad color options TBD by Architect:

23. Painted Interior Finish. Factory-applied water-borne acrylic enamel. White Meets WDMA TM-14 requirements.

2.6 Hardware

A. Locking system that provides locking, unlocking, balancing, and tilting of the sash members

B. Lock Actuator Assembly

24. Material

Zinc die-cast

finishes Oil Rubbed Bronze

25. Design Feature and Components

To unlock unit, turn the handle 135°

Lock automatically locks when both sash are closed.

Custodial lock on first floor units and standard hardware on sleeping rooms with 4-inch venting limiter. Color TBD by architect

C. Latches

26. Bottom sash latch

27. Material

i. Bolt: Glass-filled nylon

ii. Latch housing: Acetal

iii. Sash latch reinforcement: Stainless steel

D. Strike Assembly

28. Material

Zinc die-cast strike plate and injection-molded Acetal housing and button

finishes: Oil Rubbed Bronze

29. Strike assembly accommodates locking/unlocking

E. Balance System (balance system determined by sash weight)

30. Block & tackle balances

31. Hybrid spiral balances

F. Factory-applied Window Opening Control Device (WOCD) is a sash limiter that prevents the window opening more than 4” vertically. It meets ASTM F2090-17 specifications for window fall prevention standards. The system consists of two single action devices that allows for egress (when applied to an egress size window) by bypassing the 4” stop feature.

32. Material

a. WOCD device: zinc die-cast

b. WOCD strike plate: nylon

33. 2 WOCD’s applied to each double and single hung window and will be recessed into the stiles of the top sash

34. Default color matches lock handle

35. Strike plate mounted to the bottom sash check rail

36. Strike plate color to match weather strip

G. Sash Limiter

37. Bottom Sash Limiter (Acetal)

38. Available on all operator configurations

Selectable bottom sash locations, 4" Net Clear Opening (NCO)

Non-tilt hardware is default, and a sash removal tool is required in order to by-pass the Sash limiter for sash removal (tilt wash mode)

Standard application is factory applied.

Color: Will align with the Exterior Weather Strip Package selection

2.7 Weather Strip

A. Operating units:

39. Jambs: Foam-filled bulb

40. Header: Continuous dual leaf

41. Bottom rail and check rail: Hollow bulb

B. Stationary units:

42. Jambs: Foam for picture units; foam-filled bulb for transom unit

43. Header and bottom rail: Hollow bulb

2.8 Jamb Extension

A. Jamb extensions are available for various wall thickness factory-applied up to a 14” (356mm) wide

B. Finish: Match interior frame finish

2.9 Insect Screen

A. No Screens.

2.10 Simulated Divided Lites (SDL)

A. 7/8” (22mm) wide, with internal spacer bar

B. Exterior muntins: 0.050” (1.3mm) thick extruded aluminum

C. Interior muntins: Pine

D. Muntins adhere to glass with closed-cell copolymer acrylic foam tape

E. Exterior sticking: Putty

F. Interior Sticking:

44. Standard: Ogee

G. Patterns: Rectangular

H. Finish – exterior matches exterior aluminum clad colors, interior matches interior wood species and color

2.11 Accessories and Trim

A. Installation Accessories:

45. Factory-installed vinyl nailing/drip cap

B. Aluminum Extrusions:

46. Casing Profile: 1 5/16” Clad Brickmould Casing

47. Aluminum clad Extrusion: Frame Expander, Jamb Extender, Mullion Cover, Mullion Expander, Subsill, Subsill End Cap and Lineal Cap

48. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets AAMA 2605 requirements

49. Available in all exterior aluminum clad colors
    a. Subsills factory-applied

C. Exterior Sash Lugs – Standard Option

50. Standard Profile: Ogee

51. Available on Top Sash

52. Color: Available in all exterior clad color options

Color shall be the same as top sash clad color

53. Standard application is factory applied. Available for field applications

Part 3 Execution

3.1 Examination

A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General contractor before proceeding.

B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

3.2 Installation

A. Comply with Section 01 73 00.

B. Assemble and install window/door unit(s) according to manufacturer's instruction and reviewed shop drawing.

C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants.

D. Install accessory items as required.

E. Use finish nails to apply wood trim and mouldings.

3.3 Field Quality Control

A. Remove visible labels and adhesive residue according to manufacturer's instruction.

B. Unless otherwise specified, air leakage resistance tests shall be conducted at a uniform static pressure of 75 Pa (~1.57 psf). The maximum allowable rate of air leakage shall not exceed 2.3 L/sm^2 (~0.45 cfm/ft^2).

C. Unless otherwise specified, water penetration resistance testing shall be conducted per AAMA 502 and ASTM E1105 at 2/3 of the fenestration products design pressure (DP) rating using "Procedure B" – cyclic static air pressure difference. Water penetration shall be defined in accordance with the test method(s) applied.

3.4 Cleaning

A. Remove visible labels and adhesive residue according to manufacturer's instruction.

B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

3.5 Protecting Installed Construction

A. Comply with Section 07 76 00.

B. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

End of Section

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2011.

C. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.

D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.

E. BHMA A156.3 - American National Standard for Exit Devices; 2014.

F. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

G. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.

H. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.

I. BHMA A156.21 - American National Standard for Thresholds; 2014.

J. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems; 2013.

K. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.

L. ISO 9000 - ISO Standards Compendium: ISO 9000 - Quality management; 2005.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

O. NFPA 101 - Life Safety Code; 2015.

P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

T. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

U. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.

V. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

W. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.02 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware
   2. Electronic access control system components

B. Section excludes:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
    a. "Metal Doors and Frames"
    b. "Flush Wood Doors"
    c. "Stile and Rail Wood Doors"
    d. "Interior Aluminum Doors and Frames"
    e. "Aluminum-Framed Entrances and Storefronts"
    f. "Stainless Steel Doors and Frames"
    g. "Special Function Doors"
    h. "Entrances"
6. Division 26 feet'Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 feet'Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.03 REFERENCES

A. UL LLC
1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association
1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute
1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.04 SUBMITTALS

A. General:
1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
    a. Review drawings and Sections from related trades to verify compatibility with specified hardware.

b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:
1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
3. Door Hardware Schedule:
a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:
1) Door Index: door number, heading number, and Architect's hardware set number.
2) Quantity, type, style, function, size, and finish of each hardware item.
3) Name and manufacturer of each item.
4) Fastenings and other pertinent information.
5) Location of each hardware set cross-referenced to indications on Drawings.
6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
4. Key Schedule:
a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:
1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.

2. Provide Product Data:
    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule
    e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
    f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:
1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
    a. Fire door assemblies, in compliance with NFPA 80.
    b. Required egress door assemblies, in compliance with NFPA 101.

1.05 QUALITY ASSURANCE

A. Qualifications and Responsibilities:
1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:
1. Fire-Rated Door Openings:
    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings
1. Keying Conference
    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.
2. Pre-installation Conference
    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.
    e. Review required testing, inspecting, and certifying procedures.
    f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
    a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.07 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.08 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
   1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
   2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
      a. Mechanical Warranty
         1) Locks
            (a) Schlage L Series: 10 years
            (b) Schlage ND Series: 10 years
            (c) Schlage PT Series: 5 years
         2) Exit Devices
            (a) Von Duprin: 10 years
         3) Closers
            (a) LCN 4000 Series: 30 years
            (b) LCN 1460 Series: 30 years
      b. Electrical Warranty
         1) Locks
            (a) Schlage: 3 years
         2) Exit Devices
            (a) Von Duprin: 3 years

1.09 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:
1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. Ives 3CB series
2. Acceptable Manufacturers and Products:
a. Hager AB700/800 series
b. McKinney TA314/714 TA386/786 series
c. Best CB1900 series

B. Requirements:
1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide 3 knuckle, concealed bearing hinges.
3. 1-3/4 inch thick doors, up to and including 36 inches wide:
a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
b. Interior: Standard weight, steel, 4-1/2 inches high
4. 1-3/4 inch thick doors over 36 inches wide:
a. Exterior: Heavy weight, bronze/stainless steel, 5 inches high
b. Interior: Heavy weight, steel, 5 inches high
5. 2 inches or thicker doors:
a. Exterior: Heavy weight, bronze or stainless steel, 5 inches high
b. Interior: Heavy weight, steel, 5 inches high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

9. Width of hinges: 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Ives 5PB series
   2. Acceptable Manufacturers and Products:
      a. Hager 1191/1279 series
      b. McKinney T series
      c. Best F series

B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. Provide five knuckle, plain bearing hinges.
   3. 1-3/4 inch thick doors, up to and including 36 inches wide:
      a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
      b. Interior: Standard weight, steel, 4-1/2 inches high
   4. Doors over 1-3/4 inch thick or over 36 inches wide:
      a. Exterior: Bronze/stainless steel, 5 inches high
      b. Interior: Steel, 5 inches high
   5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
   6. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
   7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
      a. Steel Hinges: Steel pins
      b. Non-Ferrous Hinges: Stainless steel pins
      c. Out-Swinging Exterior Doors: Non-removable pins
      d. Out-Swinging Interior Lockable Doors: Non-removable pins
      e. Interior Non-lockable Doors: Non-rising pins

2.05 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Ives 5BB series
   2. Acceptable Manufacturers and Products:
      a. Hager BB1191/1279 series
      b. McKinney TB series
      c. Best FBB series

B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. Provide five knuckle, ball bearing hinges.
   3. 1-3/4 inch thick doors, up to and including 36 inches wide:
      a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
      b. Interior: Standard weight, steel, 4-1/2 inches high
   4. 1-3/4 inch thick doors over 36 inches wide:
      a. Exterior: Heavy weight, bronze/stainless steel, 5 inches high
      b. Interior: Heavy weight, steel, 5 inches high
   5. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches high
b. Interior: Heavy weight, steel, 5 inches high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.06 SPRING HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Ives 3SP series
   2. Acceptable Manufacturers and Products:
      a. Hager 1250 series
      b. McKinney 1502 series
      c. Best 2060 series

B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. Provide 3 knuckle, steel based, spring full mortise hinges.
   3. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
   4. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches or less in height. Do not use spring hinges of door 96 inches and greater in height.

2.07 ELECTRIC POWER TRANSFER

A. Manufacturers:
   1. Scheduled Manufacturer and Product:
      a. Von Duprin EPT-10
   2. Acceptable Manufacturers and Products:
      a. ABH PT1000
      b. Securitron CEPT-10
      c. Security Door Controls PTM
      d. Precision EPT-12C

B. Requirements:
   1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
   2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.08 FLUSH BOLTS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Rockwood

c. Trimco

B. Requirements:
1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. For doors over 90 inches in height increase top rods by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2.09 COORDINATORS

A. Manufacturers:
1. Scheduled Manufacturer:
a. Ives
2. Acceptable Manufacturers:
a. Burns
b. Trimco
c. Rockwood

B. Requirements:
1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.10 MORTISE LOCKS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. Schlage L9000 series
2. Acceptable Manufacturers and Products:
a. Sargent 8200 series
b. Best 45H series
c. Corbin-Russwin ML2000 series

B. Requirements:
1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
5. Provide locks with standard 2-3/4 inches backset with full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (0.98 inch) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches. Provide motor based electrified and motor based latch retraction locksets that comply with the following requirements:
a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case

c. Low maximum current draw – maximum 0.4 amps (Lever control) and maximum 2.0 amps (Latch retraction) to allow for multiple locks on a single power supply.
d. Low holding current (Lever control or latch retraction) – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications and motorized latch retraction applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

2.11 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. Schlage ND series
2. Acceptable Manufacturers and Products:
a. Best 9K
b. Sargent 11-Line
c. Corbin-Russwin CL3100 series

B. Requirements:
1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

2.12 EXIT DEVICES

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. Von Duprin 98 series

B. Requirements:
1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.

4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches x 3 inches steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.13 EXIT DEVICES – BAR TYPE

A. Manufacturer and Product:
   1. Scheduled Manufacturer:
      a. Von Duprin 55/88 series

B. Requirements:
   1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
   2. Cylinders: Refer to "KEYING" article, herein.
   3. Provide bar type exit devices, cast or forged of brass, bronze, or stainless steel, plated to standard architectural finishes to match balance of the door hardware.
   4. Latch Bolt Throw: 3/4 inch for rim and mortise devices, 5/8 inch for surface and concealed vertical rod devices.
   5. Mechanism Case: One piece without cover plate. Mount flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
   6. Provide UL labeled fire exit devices for fire rated openings.
   7. Provide manufacturer's standard strikes.
   8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
   9. Removable Mullions: 2 inches x 3 inches steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
   10. Provide electrified options as scheduled in the hardware sets.
   11. Furnish all necessary wood door kits and cover plates, for proper installation of exit device.
   12. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.14 POWER SUPPLIES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Schlage/Von Duprin PS900 Series

B. Requirements:
   1. Provide power supplies approved by manufacturer of supplied electrified hardware.
   2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
   3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
   4. Provide power supplies with the following features:
      a. 12/24 VDC Output, field selectable.
      b. Class 2 Rated power limited output.
      c. Universal 120-240 VAC input.
      d. Low voltage DC, regulated and filtered.
      e. Polarized connector for distribution boards.
      f. Fused primary input.
      g. AC input and DC output monitoring circuit w/LED indicators.
      h. Cover mounted AC Input indication.
      i. Tested and certified to meet UL 294.
      j. NEMA 1 enclosure.
      k. Hinged cover w/lock down screws.
      l. High voltage protective cover.

2.15 CYLINDERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Schlage Everest 29 S
   2. Acceptable Manufacturers and Products:
      a. Best Preferred Patented
      b. Corbin-Russwin Patented Keyway
      c. Sargent DG1

B. Requirements:
   1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer’s series as indicated. Refer to “KEYING” article, herein.
   2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
      a. Patented Open: cylinder with interchangeable core with open keyway.
   3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
   4. Nickel silver bottom pins.

2.16 KEYING

A. Scheduled System:
   1. New factory registered system:
      a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:
   1. Construction Keying:
      a. Replaceable Construction Cores.

1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
(a) 3 construction control keys
(b) 12 construction change (day) keys.
2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1) Master Keying system as directed by the Owner.
b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
d. Identification:
1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
e. Quantity: Furnish in the following quantities.
1) Permanent Control Keys: 3.
2) Master Keys: 6.
3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
4) Key Blanks: Quantity as determined in the keying meeting.

2.17 KEY CONTROL SYSTEM

A. Manufacturers:
1. Scheduled Manufacturer:
a. Telkee
2. Acceptable Manufacturers:
a. HPC
b. Lund

B. Requirements:
1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.18 DOOR CLOSERS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
    a. Corbin-Russwin DC8000 series
    b. Sargent 281 series

B. Requirements:
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch 1.5 inch diameter piston with 5/8-inch (0.63 inch) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.19 DOOR CLOSERS

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
    a. LCN 1460 series
2. Acceptable Manufacturers and Products:
    a. Corbin-Russwin DC6000 series
    b. Stanley QDC 200

B. Requirements:
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action cast iron cylinder.
3. Closer Body: 1-1/4-inch 1.26 inch diameter, with 5/8-inch (0.63 inch) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.

8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.20 DOOR CLOSERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. LCN 1250 series
   2. Acceptable Manufacturers and Products:
      a. Falcon SC60A series
      b. Norton 1600 series
      c. Sargent 1131 series

B. Requirements:
   1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
   2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
   3. Closer Body: 1-3/8-inch 1.38 inch diameter with 5/8-inch (0.63 inch) diameter pinion journal diameter heat-treated pinion journal and full complement bearings.
   4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
   5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   6. Pressure Relief Valve (PRV) Technology: Not permitted.
   7. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.21 ELECTROMECHANICAL CLOSER/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. LCN SEM7800 Series
   2. Acceptable Manufacturers:
      a. Norton
      b. Rixson

B. Requirements:
   1. Provide single-point or multi-point hold-open electromechanical closer/holders as specified. Coordinate voltage requirements and provide transformer if necessary.
   2. Provide closer/holders that function as full rack and pinion door closer when current is interrupted or continuous hold-open is not engaged.
   3. Provide door closers with fully hydraulic, full rack and pinion action with high strength cylinder and full complement bearings at shaft.
   4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
   5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
   7. Pressure Relief Valve (PRV) Technology: Not permitted.
   8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.22 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco
      c. Rockwood

B. Requirements:
   1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.23 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco
      c. Rockwood

B. Requirements:
   1. Provide protection plates with a minimum of 0.050 inch thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes plates 2 inches less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch less width of door on pairs without a mullion or edge guards.
   3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.24 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers:
      a. Glynn-Johnson
   2. Acceptable Manufacturers:
      a. Rixson
      b. Sargent
      c. ABH

B. Requirements:
   1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.25 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco
      c. Rockwood

B. Provide door stops at each door leaf:
   1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
   2. Where a wall stop cannot be used, provide universal floor stops.
   3. Where wall or floor stop cannot be used, provide overhead stop.

4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.26 HINGE PIN DOOR STOP

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Ives 74/75 Series
   2. Acceptable Manufacturers and Products:
      a. Door Saver III
      b. Don Jo 1513/1518

B. Requirements:
   1. Provide hinge pin door stops in carbon steel.
   2. Removable bushings shall accommodate 1/4-inch to 5/16-inch diameter hinge pins (74 series).
   3. Removable bushings shall accommodate 5/16-inch to 3/8-inch diameter hinge pins (75 series).
   4. Shall be capable of adjustment from 40-degrees to 180-degrees.

2.27 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

B. Scheduled Manufacturer:
   1. Zero International

C. Acceptable Manufacturers:
   1. National Guard
   2. Reese
   3. Pemko

D. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.
   1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
      a. Provide non-corrosive fasteners for all exterior applications.
      b. Provide security fasteners where indicated.
   2. (NOTE TO SPECIFIER Remove Seals and Gasketing subparagraph 2 inch full if Zero Everyday products are scheduled in any hardware set)Provide Neoprene, EPDM, Silicone, or Nylon Brush inserts. Provide non brush inserts of solid or sponge cell, as indicated in hardware sets.

E. Smoke Labeled Gasketing: At all smoke labeled openings, provide smoke listed perimeter gasketing assemblies complying with NFPA 105 listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke control ratings indicated based on testing according to UL 1784.

F. Fire Listed Gasketing: Assemblies complying with NFPA 80 that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated based on testing according to UL 10C.
   1. Where frame-applied intumescent seals are required by the manufacturer, provide gaskets that comply with UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies and UBC 7-2, Fire Tests of Door Assemblies.

G. (NOTE TO SPECIFIER Remove Sound-Rated Gasketing paragraph if Zero Everyday products are scheduled in any hardware set) Sound-Rated Gasketing: Provide acoustic gasketing to meet Sound Transmission Class (STC) rating required.

H. Meeting-Stile Gasketing: Where indicated, provide meeting-stile gasketing that fastens to the meeting stiles forming a continuous seal when doors are closed.

I. Door Sweeps or Shoes: Where indicated, apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.
   1. (NOTE TO SPECIFIER Remove Door Sweeps or Shoes subparagraph 1 inch full if Zero Everyday products are scheduled in any hardware set) Provide solid neoprene, EPDM, Silicone, or nylon brush type of seal as indicated in hardware sets.

J. Automatic Door Bottoms:
   1. Door bottom to be minimum of 0.72 inch thickness mortised, semi mortised, or surface mount as required.
   2. Provide closed cell sponge, bulb neoprene. or EPDM type of seal as indicated in hardware sets.

K. Rain Drips:
   1. Provide overhead rain drips for out-swinging hollow metal doors that are not covered against 45 degree blowing rain. Aluminum extrusion to be a minimum of .088 inches thick and extend 2.50 inches from the face of the frame, in anodized finish to match door.
   2. Door sweeps or shoes with integral rain drip must meet ADA requirements

L. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.
   1. Threshold extrusion to be a minimum of .125 inches thick, as indicated in the hardware sets.
   2. Provide thresholds conforming to ANSI/BHMA A156.21

2.28 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Rockwood
      c. Trimco

B. Requirements:
   1. Provide "push-in" type silencers for hollow metal or wood frames.
   2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
   3. Omit where gasketing is specified.

2.29 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Acceptable Manufacturers:
      a. National Guard
      b. Reese
      c. Pemko

2.30 ROLLER LATCHES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Ives
   2. Acceptable Manufacturers:
      a. Burns
      b. Trimco
      c. Rockwood

B. Requirements:

1. Provide roller latches with 4-7/8 inches strike at single doors to fit ANSI frame prep. If dummy levers are used in conjunction with roller latch mount roller latch at a height as to not interfere with proper mounting and height of dummy lever.
2. Provide roller latches with 2-1/4 inches full lip strike at pair doors. Mount roller in top rail of each leaf per manufacturer's template.

2.31 MAGNETIC HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. LCN
   2. Acceptable Manufacturers:
      a. Rixson
      b. Sargent

B. Requirements:
   1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.32 DOOR POSITION SWITCHES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Schlage
   2. Acceptable Manufacturers:
      a. GE-Interlogix
      b. Sargent

B. Requirements:
   1. Provide recessed or surface mounted type door position switches as specified.
   2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches between switch and magnetic locking device.

2.33 FINISHES

A. FINISH: BHMA 643E/716 (US11); EXCEPT:
   1. Door Closers: Powder Coat to Match.
   2. Weatherstripping: Dark Bronze Anodized Aluminum.
   3. Thresholds: Extruded Architectural Bronze, Oil-Rubbed

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:
1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds:
1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.

3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing:
1. Apply to head and jamb, forming seal between door and frame.
2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware sets are a guideline provide as required by door type being used.

E. Hardware Sets:

HARDWARE GROUP NO. 000

FOR USE ON DOOR #(S):

C101.1	C101.2		C103.2	C103.3	C103.4
C103.5	C114.2	C114.1	C111C.1	C102.1	C117.1
C117.2	C105.1	C106.1	C110.1	C201.1	C200.1
C200.4	C200.5	C200.8	C200A	C200B	C225.2
C225.1	C203.1	C208.1	C312.1	C317.1	C304.1
C304.2 C221.1	C300.1 C221.2	C300.2 C224.1	C312.2 C224.2	C312.3 C222.1	C312.4 C317.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR

-CASED OPENING. NO HARDWARE REQUIRED.

HARDWARE GROUP NO. 001

FOR USE ON DOOR #(S):

110B.2					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR

-ALL HARDWARE BY OVERHEAD DOOR MANUFACTURER.

HARDWARE GROUP NO. 002

FOR USE ON DOOR #(S):

SH-1	SH-2	SH-3	SH-4	SH-5	SH-6
SH-7	SH-8	SH-9	SH-10	SH-11	SH-12
SH-13	SH-14	SH-15			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR

-ALL HARDWARE BY GLASS SHOWER DOOR MANUFACTURER.

HARDWARE GROUP NO. 201C

FOR USE ON DOOR #(S):

113.1	200A.1	300A.1	304A.1	118.1	

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	F643E	IVE
1	EA	STOREROOM LOCK	L9080T 07A	643E	SCH
1	EA	FSIC PERMANENT	23-030	606	SCH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		CORE			
1	EA	SURFACE CLOSER	1461 SCUSH FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 203

FOR USE ON DOOR #(S):

321.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	STOREROOM LOCK	L9080T 07A	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	1461 REG FC	695	LCN
1	EA	WALL STOP	WS406/407CCV	643E/716	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 203S

FOR USE ON DOOR #(S):

100A.1	100B.1		117A.1		

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	F643E	IVE
1	EA	STOREROOM LOCK	L9080T 07A	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	OH STOP	90S X SIZE AS REQ	SP313	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 210R

FOR USE ON DOOR #(S):

G002.1					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	613	IVE
1	EA	DUST PROOF STRIKE	DP2	643E	IVE
1	EA	Exit Device	98L-996L-R/V-07	643E	SCH
1	EA	Rim Housing	20-057 ICX	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	COORDINATOR	COR X FL	315AN	IVE
2	EA	SURFACE CLOSER	1461 REG FC	695	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	695	IVE
2	EA	WALL STOP	WS406/407CCV	643E	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	ASTRAGAL	47D	D	ZER

HARDWARE GROUP NO. 210S

FOR USE ON DOOR #(S):

103A.1	114A.1	115B.1	222A.1	222B.1	214A.1
214B.1	300A	308A.1	114B.1		

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	F643E	IVE
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	613	IVE
1	EA	DUST PROOF STRIKE	DP2	643E	IVE
1	EA	STOREROOM LOCK	L9080T 07A	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	OH STOP	90S X SIZE AS REQ (INACTIVE)	SP313	GLY

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SURFACE CLOSER	1461 SCUSH FC (ACTIVE)	695	LCN

HARDWARE GROUP NO. 265I

FOR USE ON DOOR #(S):

201.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	B643E	IVE
1	EA	Exit Device	98L-996L-R/V-07	643E	SCH
1	EA	Rim Housing	20-057 ICX	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	SET	GASKETING	328D (HEAD & JAMBS)	D	ZER
1	EA	THRESHOLD	175D	D	ZER
1	EA	INTERLOCKING HOOK	23		ZER

HARDWARE GROUP NO. 341

FOR USE ON DOOR #(S):

102A.1	104.1	109.1			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	PRIVACY W/DEADBOLT W/ OUTSIDE INDICATOR	L9440 07A L583-363 OS-OCC	643E	SCH
1	EA	SURFACE CLOSER	1461 REG FC	695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 401

FOR USE ON DOOR #(S):

207.1	229.1	215.1	301.1		

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	PASSAGE SET	L9010 07A	643E	SCH
1	EA	SURFACE CLOSER	1461 REG FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 401R

FOR USE ON DOOR #(S):

G003.1	320.1				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	CLASSROOM LOCK	L9070T 07A	643E	SCH
1	EA	SURFACE CLOSER	1461 REG FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER

HARDWARE GROUP NO. 463

FOR USE ON DOOR #(S):

101A.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	INVISIBLE HINGE	418	DKB	SOS
1	EA	INVISIBLE LATCH	CL12	626	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	AUXILIARY PUSHER	CL14	626	IVE

HARDWARE IS A GUIDELINE. PROVIDE AS REQUIRED BY DOOR TYPE BEING USED.

HARDWARE GROUP NO. 512S

FOR USE ON DOOR #(S):

105A.1					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	F643E	IVE
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	613	IVE
1	EA	DUST PROOF STRIKE	DP2	643E	IVE
1	EA	CLASSROOM LOCK	L9070T 07A	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
2	EA	OH STOP	410S SIZE AS REQ	SP313	GLY

HARDWARE GROUP NO. 738R

FOR USE ON DOOR #(S):

200.2	200.3				

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	FIRE EXIT HARDWARE	9927-L-BE-F-LBRAFL-LON	643E	VON
1	EA	FIRE EXIT HARDWARE	9927-L-BE-F-LBR-LON	643E	VON
2	EA	SURFACE CLOSER	1461 REG FC	695	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	695	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	695	LCN

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	MEETING STILE	8195D	D	ZER

-PROVIDE FIRE ALARM CONNECTIONS FOR WALL MAGNETIC HOLD OPENS.
-CONNECT THE MAGNETIC HOLD OPENS TO THE FIRE ALARM SYSTEM.
-THE MAGNETIC HOLD OPENS ARE TO RELEASE UPON ACTIVATION OF THE FIRE ALARM SYSTEM.

HARDWARE GROUP NO. 801H

FOR USE ON DOOR #(S):

	119.1	221.1	224.1	216.1	
312.1	312.2				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	F643E	IVE
1	EA	PUSH PLATE	8200 4" X 16"	695	IVE
1	EA	PULL PLATE	8303 10" 4" X 16" F	643E	IVE
1	EA	SURFACE CLOSER	1461 H FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 801HN

FOR USE ON DOOR #(S):

105.1	108.2				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	F643E	IVE
1	EA	PUSH PLATE	8200 4" X 16"	695	IVE
1	EA	PULL PLATE	8303 10" 4" X 16" F	643E	IVE
1	EA	SURFACE CLOSER	1461 HW/PA FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 902P

FOR USE ON DOOR #(S):

102.1	117.1	115.1	201.2		

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	POCKET DOOR FRAME	1500SC X SIZE AS REQ		JOH
1	EA	CONVERGING DOOR KIT	1555PPK3		JOH
4	EA	FLUSH PULL	227	B643E	IVE
2	EA	DOOR EDGE PULL	230	B643E	IVE

HARDWARE GROUP NO. 903P

FOR USE ON DOOR #(S):

116.1	115.2	107.3	107.2	107.1	112E.1
205C.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	POCKET DOOR FRAME	1500SC X SIZE AS REQ		JOH
2	EA	FLUSH PULL	227	B643E	IVE
1	EA	DOOR EDGE PULL	230	B643E	IVE

HARDWARE GROUP NO. C741R

FOR USE ON DOOR #(S):

1ST3.2	2ST3.1	3ST3.1	GST1.1	1ST2.2	2ST2.1
3ST2.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5	F643E	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8	F643E	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-L-F-M996-LON-FS-CON (FAIL SAFE)	643E	VON
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	1461 REG FC	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	EA	WALL STOP	WS406/407CCV	643E	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	BY OWNER		UNK
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PANIC HARDWARE.
-CONNECT THE ELECTRIFIED TRIM TO THE FIRE ALARM SYSTEM.
-THE ELECTRIFIED TRIM WILL UNLOCK UPON ACTIVATION OF THE FIRE ALARM SYSTEM FOR STIREWELL REENTRY.

HARDWARE GROUP NO. CY714

FOR USE ON DOOR #(S):

G001.5					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	B643E	IVE
2	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8	B643E	IVE
1	EA	ELEC PANIC HARDWARE	RX-8847-EO	643E	VON
1	EA	ELEC PANIC HARDWARE	RX-8847-L-BE-E371-07-	643E	VON

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
			FSE (FAIL SECURE)		
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	695	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	695	IVE
1	SET	GASKETING	328D (HEAD & JAMBS)	D	ZER
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	MEETING STILE	8195D	D	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	CREDENTIAL READER	BY OWNER		UNK
1	EA	DOOR PROPPED ALARM	EAX-300 X SK4	BLK	DET
1	EA	POWER SUPPLY	BY OWNER		

HARDWARE GROUP NO. CY715

FOR USE ON DOOR #(S):

108.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	B643E	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	POWER TRANSFER	EPT10 CON	SP313	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-L-NL-LON-CON	643E	VON
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	SET	GASKETING	328D (HEAD & JAMBS)	D	ZER
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	BY OWNER		UNK
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	DOOR PROPPED ALARM	EAX-300 X SK3	BLK	DET

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

HARDWARE GROUP NO. CYE715

FOR USE ON DOOR #(S):

100.1	103.1	114.1			

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	B643E	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8	B643E	IVE
1	EA	ELEC PANIC HARDWARE	RX-55-NL	643E	VON
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	ELECTRIC STRIKE	9500	613	HES
1	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	SET	GASKETING	328D (HEAD & JAMBS)	D	ZER
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	BY OWNER		UNK
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	BLK	SCE
1	EA	DOOR PROPPED ALARM	EAX-300 X SK3	BLK	DET
1	EA	POWER SUPPLY	BY OWNER		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PANIC HARDWARE.

HARDWARE GROUP NO. S343

FOR USE ON DOOR #(S):

119A.1	119B.1	119C.1	221A.1	221B.1	221C.1
221D.1	224A.1	224B.1	224C.1	312A.1	312B.1
312C.1	312D.1	312E.1	312F.1	312G.1	

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HINGE	3CB1 4.5 X 4.5	F643E	IVE
2	EA	SPRING HINGE	3SP1 4.5 X 4.5	F643E	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S ATH OS-OCC	643E	SCH
1	EA	WALL STOP	WS406/407CCV	643E	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. U201

FOR USE ON DOOR #(S):

202.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	STOREROOM LOCK	ND80TD ATH	643E	SCH
1	EA	SURFACE CLOSER	1250 REG	695	LCN
1	EA	HINGE PIN STOP	75	F10B	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	DOOR SHOE	253A	A	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	VIEWER COVER	890311	643E	IVE
1	EA	VIEWER	U698 (PROVIDE 2 @ ACCESSIBLE UNITS)	B643E	IVE

HARDWARE GROUP NO. U303

FOR USE ON DOOR #(S):

112D.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1 4.5 X 4.5	F643E	IVE
1	EA	PRIVACY LOCK	PT40 ATH - BACKSET AS REQ	643E	SCH
1	EA	HINGE PIN STOP	75	F10B	IVE

HARDWARE GROUP NO. U403

FOR USE ON DOOR #(S):

112B.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1 4.5 X 4.5	F643E	IVE
1	EA	PASSAGE SET	PT10 ATH	643E	SCH
1	EA	HINGE PIN STOP	75	F10B	IVE

HARDWARE GROUP NO. U802

FOR USE ON DOOR #(S):

204A.1	204B.1	205A.1	205B.1	206A.1	206B.1
212A.1	212B.1	211A.1	211B.1	209A.1	209B.1
206D.1	206C.1	210A.1	210B.1	226A.1	226B.1
226C.1	227A.1	227B.1	228A.1	228B.1	230A.1
230B.1	230C.1	219A.1	219B.1	220A.1	220B.1
230D.1	231B.1	231A.1	223A.1	223B.1	232B.1
232A.1	218A.1	218B.1	213A.1	213B.1	217A.1
217B.1	307A.1	307B.1	307C.1	307D.1	306A.1
306C.1	306B.1	305A.1	305B.1	305C.1	305D.1
303A.1	303B.1	303C.1	303C.1	302A.1	309A.1
309B.1	302B.1	302C.1	310A.1	310B.1	302D.1
323A.1	313A.1	313B.1	315A.1	315B.1	314A.1
314B.1	323B.1	323C.1	323D.1	322A.1	322B.1
322C.1	322D.1	315C.1	315D.1	316A.1	316B.1
316C.1	316D.1	318A.1	318B.1	318C.1	319A.1
319B.1	319C.1	319D.1	311A.1	311B.1	

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5PB1 4.5 X 4.5	F643E	IVE
2	EA	ROLLER LATCH	RL32	643E	IVE
2	EA	SINGLE DUMMY TRIM	PT170 ATH	643E	SCH
2	EA	HINGE PIN STOP	75	F10B	IVE

HARDWARE GROUP NO. UK201

FOR USE ON DOOR #(S):

112.2	232.1	204.1	223.1	205.1	231.1
206.1	230.1	209.1	228.1	210.1	227.1
220.1	211.1	226.1	219.1	212.1	218.1
213.1	217.1	323.1	302.1	314.1	313.1
322.1	303.1	318.1	305.1	315.1	316.1
306.1	319.1	311.1	307.1	310.1	309.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	PASSAGE SET	PT10 ATH	643E	SCH
1	EA	KEYPAD DEADBOLT	BE365NF20 PLY	716	SCH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SURFACE CLOSER	1250 REG	695	LCN
1	EA	HINGE PIN STOP	75	F10B	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	DOOR SHOE	253A	A	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	VIEWER COVER	890311	643E	IVE
1	EA	VIEWER	U698 (PROVIDE 2 @ ACCESSIBLE UNITS)	B643E	IVE

HARDWARE GROUP NO. UY205

FOR USE ON DOOR #(S):

112.1					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	B643E	IVE
1	EA	PASSAGE SET	PT10 ATH	643E	SCH
1	EA	KEYPAD DEADBOLT	BE365NF20 PLY	716	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC	695	LCN
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	DOOR PROPPED ALARM	EAX-300 X SK3	BLK	DET

HARDWARE GROUP NO. Y264

FOR USE ON DOOR #(S):

105.5	105.7				

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	613	IVE
1	EA	DBL CYL STORE W/DB	L9466T 07A	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
2	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	OH STOP	100S SIZE AS REQ (INACTIVE LEAF)	SP313	GLY
1	EA	DOOR PROPPED ALARM	EAX-300 X SK4	BLK	DET

HARDWARE GROUP NO. Y714

FOR USE ON DOOR #(S):

G001.1	G001.2	G001.3	G001.4	105.2	105.3
105.4					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PANIC HARDWARE	8847-DT	643E	VON
1	EA	PANIC HARDWARE	8847-NL-OP	643E	VON
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	MEETING STILE	8195D	D	ZER
1	EA	DOOR PROPPED ALARM	EAX-300 X SK4	BLK	DET

HARDWARE GROUP NO. Y800

FOR USE ON DOOR # (S):

G004.1					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	F643E	IVE
1	EA	Exit Device	98L-996L-R/V-07	643E	SCH
1	EA	Rim Housing	20-057 ICX	643E	SCH
1	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC	695	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	695	IVE
1	EA	GASKETING	9188SBK (HEAD & JAMBS)	BK	ZER

HARDWARE GROUP NO. Y264

FOR USE ON DOOR #(S):

105.6					

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	613	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DBL CYL STORE W/DB	L9466T 07A	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
2	EA	FSIC PERMANENT CORE	23-030	606	SCH
1	EA	ELECTRIC STRIKE	6221	613	VON
1	EA	OH STOP	100S SIZE AS REQ (INACTIVE LEAF)	SP313	GLY
1	EA	GASKETING	328D (HEAD & JAMBS)	D	ZER
1	EA	DOOR PROPPED ALARM	EAX-300 X SK4	BLK	DET
1	EA	POWER SUPPLY	BY OWNER	1	EA

HARDWARE GROUP NO. CY715

FOR USE ON DOOR #(S):

1ST3.1	1ST2.1				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	B643E	IVE
1	EA	PANIC HARDWARE	98L-996L-R/V-07	643E	VON
1	EA	RIM CYLINDER	20-057 ICX	643E	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX (FOR DOOR PROP ALARM)	622	SCH
1	EA	FSIC PERMANANT CORE	23-030	622	SCH
1	EA	FSIC PERMANENT	23-030	606	SCH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		CORE			
1	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	695	IVE
1	SET	GASKETING	328D (HEAD & JAMBS)	D	ZER
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER
1	EA	DOOR PROPPED ALARM	EAX-300 X SK3	BLK	DET
EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON	

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units to be installed in window opening or door assemblies.

C. Fire-resistant rated and Fire-Protection rated glazing.

D. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

K. GANA (GM) - GANA Glazing Manual; 2022.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

N. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2004).

P. ITS (DIR) - Directory of Listed Products; current edition.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

R. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2012.

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

U. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

V. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

W. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

X. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Z. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit one sample 12 by 12 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

1.06 MOCK-UPS

A. Provide mock-up of window assembly including glass and air barrier and vapor retarder seal.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com
   2. Bendheim; https://bendheim.com
   3. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Fire-Resistance-Rated and Fire-Protection-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Manufacturers:
   2. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
   3. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.

4. Vetrotech North America; Contraflam: www.vetrotechusa.com/#sle.

C. Mirrored Glass Manufacturers:
   1. Pilkington North America Inc; Pilkington Mirropane Transparent Mirror: www.pilkington.com/na/#sle.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7 or no less than as indicated on structural plans for building ultimate wind speed.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/200 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
      a. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
      b. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
      c. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
      d. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Cardinal Glass Industries
   2. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:

a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.

6. Color: Black.
7. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Typical all ____ Exterior glazing locations unless specifically noted otherwise.
a. Low E 3 / Cardinal 366 Duel insulated glass
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
b. Coating: Low-E (solar control type)E366 , on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.24, nominal.

D. IG1-T - Insulating Glass Units: Safety glazing.
1. Applications: provide this type of glazing in the following locations:
a. Glazed lites in all exterior doors - excluding custom doors
b. Glazed sidelights and panels next to doors. - excluding custom doors
c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on drawings.
2. Space between lites filled with air.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.

E. IG-2 - Insulating Glass Units: Safety Glazing
1. Applicatons: Provide this type of glazing in the following locations
a. Glazed lites in all exterior doors.
b. Glazed sidelights and panels next to doors.
2. Space between lites filled with air.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
a. Tint: Clear.
b. Total Thickness: 3/4 inch.

2.05 GLAZING UNITS

A. Type G-1 - Monolithic Interior Vision Glazing:
1. Applications: Tyipcal Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.
5. Glazing Method: Dry glazing method, gasket glazing.

B. Type GL-2 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period of 20 minutes or less.
1. Applications:
a. Glazing in fire-rated door and window assemblies.
b. Other locations as indicated on drawings.
2. Glass Type: Specialty tempered float glass with modifications such as surface applied films as necessary or required.

3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Glazing Method: As required for fire rating.
6. Fire-Rating Period: 20 min .
7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
    a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
    b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
    c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
    d. "XXX" - placeholder that represents fire-rating period, in minutes.

C. Type GL-3- Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period of 45 minutes or less.
1. Applications:
    a. Glazing in fire-rated door and window assemblies.
    b. Glazing in fire-rated window assembly.Other locations as indicated on drawings.
2. Glass Type: Specialty tempered float glass with modifications such as surface applied films as necessary or required.
3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Glazing Method: As required for fire rating.
6. Fire-Rating Period: 45 minutes
7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
    a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
    b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
    c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
    d. "XXX" - placeholder that represents fire-rating period, in minutes.

D. Type GL-4- 1/4" Laminated Architectural Glazing
1. Applications:Glazing in custom millwork
2. Manufacturers:
    a. Bendheim

E. Type GL-5 - Faux Antique Mirror
1. Applications:
2. Manufacturers:
    a.

2.06 GLAZING COMPOUNDS

A. Manufacturers:
1. BASF Corporation: www.basf.com/#sle.
2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
3. Pecora Corporation: www.pecora.com/#sle.
4. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

F. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building. Follow window assembly manufacturer instructions for placement of glazing.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact. Apply sealant at corners as necessary to ensure gasket has full contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact. Apply sealant at corners as necessary to ensure gasket has full contact.

G. Carefully trim protruding tape with knife.

3.06 INSTALLATION - MIRRORS

A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirros with edge clearance free of surrounding construction including countertops or backsplashes.

3.07 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Annealed float glass.
   2. Tempered safety glass.

B. Decorative mirrors.

1.02 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2011.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution; ____: www.binswangerglass.com/#sle.
   2. Lenoir Mirror Co; ____: www.lenoirmirror.com/#sle.
   3. Trulite Glass and Aluminum Solutions; _____: www.trulite.com/#sle.
   4. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Decorative Mirrors:
   1. GGI - General Glass International; Antique Mirror: www.generalglass.com/#sle.
   2. Walker Glass Company Ltd; Walker Textures Acid-Etched Mirrors: www.walkerglass.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch.
   2. Edges: Arrised.
   3. Size: As scheduled.
   4. Size: As indicated on drawings.

C. Decorative Mirror Glass; Type ____: Clear, annealed float glass; ASTM C1036.
   1. Thickness: 1/4 inch.
   2. Pattern: Bianco e Nero - Antique.
   3. Edges: Chamfered arris.
   4. Size: As scheduled.
   5. Size: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal partition and soffit framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Framing Accessories.

1.02 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

J. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

M. ASTM E413 - Classification for Rating Sound Insulation; 2022.

N. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

O. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
   1. Indicate special details associated with fireproofing and acoustical seals.

2. Indicate component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
3. Describe method for securing studs to track, splicing, and for blocking and reinforcing of framing connections.
4. Provide partition legend indicating proposed assembly components at each partition type.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system. Include framing load charts and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

1.05 MOCK-UP

A. Provide mock-up of stud wall, ceiling, and soffit framing including insulation, sheathing, window frame, and door frame and finish specified in other sections. Coordinate installation of associated work specified in other sections.
1. Mock-up may remain part of finish work.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic and/or STC on partition schedule: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
2. Treat all penetrations and perimeters of wall assembly with acoustical sealant, both sides of wall.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

E. Fire Rated Assemblies: Provide completed assemblies as indicated on partition schedule and complying with applicable code.
1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
1. ClarkDietrich: www.clarkdietrich.com/#sle.

2. Marino: www.marinoware.com/#sle.
3. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf, with steel thickness not less than 20 gauge (30 mils). Adjust steel thickness to comply with deflection with stud heights. Walls with tile or masonry veneer, comply with deflection of wall framing of L/360 at 5psf.
1. Studs: "C" shaped with knurled or emobossed faces.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

E. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs.

F. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

G. Metal Framing Fasteners: ASTM C1002 self-piercing tapping screws.

H. Sheet Metal Backing: 0.036 inch thick, galvanized.

I. Partial Height partitions: Use steel wall stiffeners bolted to floor surface and stud framing at 48" o.c., minimum of two per wall. Provide No-Flex Stud Stiffeners, or approved equal. www.noflex.com.

J. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
1. Products:
a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
3. National Gypsum Company: www.nationalgypsum.com/#sle.
4. Temple-Inland Building Product by Georgia-Pacific, LLC: www.temple.com.
5. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for standard vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
b. Mold resistant board is required at all toilet rooms, janitor closets, laundry rooms, kitchen and similar wet areaat all wet locations such as: Locker, shower, toilet rooms, kitchens, janitor closets, etc and behind plumbing fixtures locations. Also refer to partition schedule and locations otherwise noted.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

4. Thickness:
    a. Vertical Surfaces: 5/8 inch.
    b. Ceilings: 5/8 inch., sag resistant.
5. Paper-Faced Products:
    a. American Gypsum Company; LightRoc Gypsum Wallboard.
    b. Georgia-Pacific Gypsum; ToughRock.
    c. Georgia-Pacific Gypsum; ToughRock Fireguard X.
    d. Georgia-Pacific Gypsum; ToughRock Fireguard C.
    e. Substitutions: See Section 01 6000 - Product Requirements.
6. Mold Resistant Paper Faced Products:
    a. American Gypsum Company; M-Bloc.
    b. Continental Building Products; Mold Defense Type X.
    c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
    d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
    e. National Gypsum Company; Gold Bond XP Gypsum Board.
    f. Lafarge North America Inc; Mold Defense Drywall.
    g. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
    h. Temple-Inland Building Product by Georgia-Pacific, LLC; ComfortGuard Mold Resistant Gypsum Board.
    i. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.

C. Tile Backer Board: As specified in section 09 3000.

D. Exterior Sheathing Board: As specified in Section 06 1000.

E. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

D. Water-Resistive Barrier: As specified in Section 07 2500.

E. Finishing Accessories: ASTM C1047, galvanized steel, pre-approved rigid plastic, rolled zinc, pre-approved rigid plastic, or pre-approved rigid plastic, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
3. Products:
    a. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
    b. Trim-tex, Inc: www.trim-tex.com/#sle.
    c. Fry Reglet Corporation; www.fryreglet.com
    d. Substitutions: See Section 01 6000 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, vinyl-based, ready-mixed.

4. Joint Compound: Setting type, field-mixed.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

2.05 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Verify existing conditions before starting work.

C. Verify that rough-in utilities are in proper location.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
1. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center or as otherwise scheduled.
1. Extend partition framing to structure in all locations or as otherwise specifically noted on partition schedule.
2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
3. Align stud web openings horizontally.
4. Secure studs to track using fastener method. Do not weld.
5. Stud splicing is not permissible.
6. Fabricate corners using a minimum of three studs.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jamb, not more than 2 inches from each side of opening. Refer to framing details on plans.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation: Horizontal.
2. Spacing: As indicated.

F. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

H. Blocking: Coordinate installed bucks, support systems, anchors and blocking with electrical, mechanical and other work to be placed within or behind stud framing. Install wood blocking for support of:
   1. Wall-mounted cabinets.
   2. Plumbing fixtures.
   3. Toilet partitions.
   4. Toilet accessories.
   5. Wall-mounted door hardware.

3.04 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflections to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap spice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls and rigid secure. Lap splices securely.

G. Laterally brace suspension system.

3.05 ACOUSTIC ACCESSORIES INSTALLATION

A. Install insulation material type as indicated in 07 2100 into partition cavities.

B. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions. At locations in stud cavities not covered by sheetrock, install strapping or retainer wires to hold insulation in place.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.06 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Mold Resistant Gypsum Board: Use at all wall and ceiling surfaces in toilet rooms, janitor closets, laundry rooms, kitchens, and similar wet areas not indicated to receive wall tile.

1. At single plumbing fixtures locations: Install from floor to 24 inches vertically above fixture and 12 inches horizontally past edge of fixture.

F. Tile Backer Board: Install at all locations scheduled to receive tile. Seal all joints penetrations through backer board with sealant. Install in accordance with ANSIO A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

H. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.07 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. Not more than 30 feet apart on ceiling over 50 feet long and/or where framing changes directions.
3. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on the drawings. Provide vent area specified or no less than 1/150 of area vented.

3.08 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, walls behind specialty dry-erase coatings and other areas specifically indicated.
2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction. Installation must conform to UL or STC ratings at Fire Rated and Acoustical Partitions.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
3. Taping, filling and sanding is not required at base layer of double layer applications, unless required by UL fire resistance rating.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.09 QUALITY CONTROL

A. Prior to installation of wall board on stud walls, coordinate review with Architect and AHJ inspections and approvals.

B. Prior to covering up with suspended ceilings, coordinate above ceiling review with Architect. Review to observe installation of acoustical sealant, fire wall installation and labels, mechanical equipment installation and clearances, etc. Coordinate with AHJ inspections and approvals.

3.10 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2400
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cement plastering.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Water-resistive barrier.

B. Section 09 2236 - Lath: Lath, furring, beads, screeds, and joint accessories for plaster base.

C. Section 09 9113 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

B. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

D. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

E. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014.

F. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.

G. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015 (Reapproved 2020).

H. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2024.

I. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).

J. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2025a.

K. ASTM C1328/C1328M - Standard Specification for Plastic (Stucco) Cement; 2023.

L. ASTM C933 - Standard Specification for Welded Wire Lath; 2023.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

N. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

O. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

P. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. ICC (IRC) - International Residential Code for One- and Two-Family Dwellings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

S. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide data on plaster materials and trim accessories.

C. Samples:
   1. Submit two samples, ___ by ___ inch in size illustrating finish color and texture.

2. Submit two samples of each type trim accessory.

1.05 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Mock-Up Panel: Construct a 4 foot wide by 8 foot high sample panel of plaster work at the jobsite demonstrating installation procedures, finish texture, and color. Show each phase of installation including framing and reinforcement.

C. Construct mock-up of exterior and interior wall, ____ feet long by ____ feet wide, illustrating surface finish.
   1. Locate where directed.
   2. Mock-up may remain as part of this work.

1.06 FIELD CONDITIONS

A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

B. Interior Plaster Work: Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until fully cured.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

A. Lath Plaster Base: Metal lath.
   1. Plaster Type: Factory prepared plaster mix.
   2. Number of Coats: Three.
   3. First Coat: Apply to a nominal thickness of 3/8 inch.
   4. Second Coat: Apply to a nominal thickness of 3/8 inch.
   5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
   6. Finish Coat: Apply to a nominal thickness of 1/8 inch.
   7. Finish: Acrylic.

B. Solid Plaster Base: Concrete masonry.
   1. Number of Coats: Three.
   2. Second Coat: Apply to a nominal thickness of 1/4 inch.
   3. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
   4. Finish Coat: Apply to a nominal thickness of 1/8 inch.
   5. Finish: Acrylic.

2.02 FACTORY PREPARED CEMENT PLASTER

A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:
   1. ICC (IBC), Section _____.
   2. ICC (IRC), Section _____.
   3. UL (FRD) Assembly Design No. ____.
   4. ICC-ES Evaluation Report No. _____.

B. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
   1. Provide continuous exterior insulation as part of the system, by the same manufacturer.
   2. Provide weather resistive barrier as part of the system, by the same manufacturer.
   3. Manufacturer - Basis of Design:
      a. LaHabra; FastWall 300: www.lahabrastucco.com/#sle.
      b. Sika Corporation; Parex Armourwall 300: www.parex.com/#sle.
   4. Other Acceptable Manufacturers:
      a. Dryvit Systems, Inc; Dryvit Stuccoat One-Coat System: www.dryvit.com/systems/stucco/#sle.

b. LaHabra; FastWall 300: www.lahabrastucco.com/#sle.
c. Master Wall, Inc; Cemplaster Fiberstucco: www.masterwall.com/#sle.
d. Sika Corporation; LaHabra FastWall 300-W HE: www.usa.sika.com/en/construction/eifs-stucco.html/#sle.
e. Sika Corporation; Senergy Platinum CI Stucco Ultra: www.usa.sika.com/en/construction/eifs-stucco.html/#sle.
f. Sika Corporation; Parex Armourwall 300: www.parex.com/#sle.
g. Sto Corp; Sto Powerwall: www.stocorp.com/#sle.
h. _____.
i. Substitutions: See Section 01 6000 - Product Requirements.

C. Premixed One-Coat Base: Mixture of Type I Portland cement complying with ASTM C150/C150M, hydrated lime complying with ASTM C207, fibers and other approved ingredients; install in accordance with ASTM C926.
1. Manufacturers:
a. Magna Wall, an Oldcastle brand; Magna Wall Fiber Reinforced One Coat Stucco: www.magnawall.com/#sle.
b. Mapei Corporation; Planitop Base Coat: www.mapei.com/#sle.
c. The QUIKRETE Companies; _____: www.quikrete.com/#sle.
d. _____.
e. Substitutions: See Section 01 6000 - Product Requirements.

D. Premixed Base Coats: Mixture of cement, aggregate, fibers, and proprietary admixtures for scratch and brown coats; install in accordance with ASTM C926.
1. Manufacturers:
a. Amerimix, an Oldcastle APG brand; AMX 740 Premium & Pumpable Fiber Base Coat Stucco: www.amerimix.com/#sle.
b. The QUIKRETE Companies; _____: www.quikrete.com/#sle.
c. _____.
d. Substitutions: See Section 01 6000 - Product Requirements.

E. Premixed Leveling Coat: Acrylic polymer-based blend approved for use with plaster manufacturer's base coat and finish materials.
1. Manufacturers:

F. Premixed Finish Coating: Same product as base coat.

G. Painted Finish Coating: See Section 09 9113.

H. Primer: Acrylic, as recommended by coating manufacturer and compatible with plaster base coat.
1. Manufacturers:
a. _____.
b. _____.
c. Substitutions: See Section 01 6000 - Product Requirements.

I. Premixed Finish Coating: Integrally colored, acrylic coating.
1. Color: As indicated on drawings.
2. Manufacturers:
a. _____.
b. _____.
c. Substitutions: See Section 01 6000 - Product Requirements.

J. Premixed Textured Coating: Polymer modified acrylic coating, integrally colored, and trowel applied to substrates prepared in accordance with manufacturer's written installation instructions.
1. Color: As indicated on drawings.
2. Manufacturers:

a. Dryvit Systems, Inc; Dryvit Textured Acrylic Finishes (TAFS): www.dryvit.com/systems/#sle.
b. Senergy by Sika Corporation; Classic: www.usa.sika.com/en/construction/eifs-stucco.html/#sle.
c. Sika Corporation; Parex AquaSol Swirl Fine: www.parex.com/#sle.
d. Sto Corp; Powerflex Fine: www.stocorp.com/#sle.
e. Sto Corp; Powerwall Freeform: www.stocorp.com/#sle.
f. _____.
g. Substitutions: See Section 01 6000 - Product Requirements.

K. Finish Coating: Portland cement-based coating with acrylic admixture, integrally colored, and trowel applied.
1. Color: As indicated on drawings.
2. Manufacturers:
a. SILPRO Corporation; California Stucco: www.silpro.com/#sle.
b. _____.
c. _____.
d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 JOBSITE MIXED CEMENT PLASTER

A. Fire Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with:
1. ICC (IBC), Section _____.
2. ICC (IRC), Section _____.
3. UL (DIR) Assembly Design No. ____.
4. ICC-ES Evaluation Report No. _____.
5. _____.

B. Materials:
1. Portland Cement: ASTM C150/C150M, Type I.
a. Finish Coat: White color.
2. Masonry Cement: ASTM C91/C91M, Type N.
3. Plastic Cement: ASTM C1328/C1328M.
4. Lime: ASTM C206 Type S.
5. Sand: Clean, well graded, and complying with ASTM C897.
6. Water: Clean, fresh, potable, and free of mineral or organic matter that could adversely affect plaster.
7. Admixture: Air entrainment type.
8. Plaster Mix Reinforcement: Glass fibers, chopped to 1/2 inch nominal length, and alkali resistant.
9. Color Pigment: Mineral oxide type, _____ color.
10. Exposed Aggregate: Marble.
a. Color: As selected by Architect.

2.04 ACCESSORIES

A. Lath:
1. Wire Size: 17 gauge, 0.453 inch.
2. Galvanized: ASTM A641/A641M.
3. Opening Size: 11/16 by 1-1/2 inches.
4. Comply with ASTM C933.
5. Products:
a. Structa Wire, a ClarkDietrich Company; Megalath: www.structawire.com/#sle.
b. _____.
c. _____.
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Finishing Accessories: See Section 09 2236.

C. Finishing Accessories: ASTM C1063; extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924M G90, rolled zinc, or rigid plastic, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Products:
      a. Same manufacturer as framing materials.
      b. Flannery, Inc; Metal Trim for Plaster and Stucco: www.flannerytrim.com/#sle.
      c. Stockton Products; Extruded Aluminum: www.stocktonproducts.com/#sle.
      d. _____.
      e. Substitutions: See Section 01 6000 - Product Requirements.

D. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.
   1. Manufacturers:
      a. Larsen Products Corp; Weldcrete: www.larsenproducts.com/#sle.
      b. _____.
      c. _____.
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Reinforcing Mesh: 4.5 oz/sq yd alkali-resistant mesh.

F. Water-Resistive Barrier: See Section 07 2500.

G. Water Repellent and Permeability Reducing Admixture: Nontoxic, no VOCs.
   1. Water Permeability: 120 percent less permeable compared to nontreated specimen for 7/8-inch three-coat stucco system when tested in accordance with ASTM E96/E96M.
   2. Products:
      a. ISE Logik Industries, Inc; StuccoDri: www.stuccodri.com/#sle.
      b. _____.
      c. _____.
      d. Substitutions: See Section 01 6000 - Product Requirements.

H. Rainscreen Drainage Material:
   1. Rainscreen Drainage Mat: Polyester or polypropylene mesh.
      a. Thickness: 1/4 inch.
      b. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
      c. Seam Tape and Bug Screen: As recommended by rainscreen drainage mat manufacturer.
      d. Manufacturers:
   2. Rainscreen Drainage Panels: Ribbed, dimpled, or channeled polyethylene or extruded polystyrene sheets with polypropylene fabric mortar screen on one face.
      a. Thickness: 1/8 inch.
      b. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
      c. Seam Tape and Bug Screen: As recommended by rainscreen drainage sheet manufacturer.
      d. Manufacturers:
         1) Dorken Systems Inc; _____: www.dorken.com/#sle.
         2) Kingspan Insulation LLC; _____: www.kingspan.com/#sle.
         3) Masonry Technology, Inc; _____: www.mtidry.com/#sle.
         4) _____.
         5) Substitutions: See Section 01 6000 - Product Requirements.
   3. Drainable Housewrap: Combination drainage layer/water-resistive sheet.
      a. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

b. Seam and Perimeter Tape: As recommended by housewrap manufacturer.
c. Manufacturers:
    1) Benjamin Obdyke Inc; _____: www.benjaminobdyke.com/#sle.
    2) DuPont Building Innovations; _____: www.dupont.com/#sle.
    3) Henry, a Carlisle Company; _____: www.henry.com/#sle.
    4) _____.
    5) Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify masonry joints are flush and surfaces are ready to receive work of this section, and that there are no existing bituminous or water repellent coatings on masonry surfaces.

C. Verify concrete surfaces are flat, honeycombs are filled flush, and surfaces are ready to receive work of this section, and that there are no existing bituminous, water repellent, or form release agent coatings on concrete surfaces that may be detrimental to plaster bond.

D. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

E. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.

C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

D. Apply dash bond coat of plaster to solid bases and moist cure for at least 24 hours before applying first coat of jobsite mixed plaster.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

A. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.

B. Integrate water-resistive barrier with flashing accessories, and adjacent doors, windows, penetrations, and cladding transitions.

C. Apply water-resistive barrier horizontally with upper layer lapped over lower layer at least 2 inches.

D. Lap water-resistive barrier at least 6 inches at vertical joints.

E. Lap water-resistive barrier at least 16 inches beyond vertical line of inside and outside corners in both directions.

F. For two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.04 INSTALLATION - RAINSCREEN DRAINAGE MATERIAL

A. Install rainscreen drainage material and metal lath with accessories over sheathing material and water-resistive barrier with fastening system in accordance with ASTM C1063 into wood or metal studs. Install drainage material with filter fabric mortar screen to exterior.

3.05 MIXING

A. Mix only as much plaster as can be used prior to initial set.

B. Mix materials dry, to uniform color and consistency, before adding water.

C. Add air entrainment admixtures to each coat to provide 5 to 7 percent air entrainment.

D. Do not retemper mixes after initial set has occurred.

E. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.06 APPLICATION

A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

B. Base Coats:
   1. Apply base coat(s) to fully embed lath and to specified thickness.
   2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.

C. Leveling Coat:
   1. Apply leveling coat to specified thickness.
   2. Fully embed reinforcing mesh in leveling coat.

D. Finish Coats:
   1. Cement Plaster:
      a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
      b. Apply desired surface texture while mix is still workable.
      c. Float to a consistent finish.
      d. Aggregate Surfacing: Hand apply to provide full surface coverage.
   2. Primer and Acrylic Coatings:
      a. Remove surface contaminants such as dust and dirt without damaging substrate.
      b. Apply primer in accordance with manufacturer's instructions.
      c. Apply finish coating in number of coats and to thickness recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.08 REPAIR

A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

SECTION 09 2700
PLASTER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass-fiber-reinforced gypsum fabrications as indicated on drawings.
   1. Interior column covers.
   2. Interior trim and moldings.
   3. Interior ornamental features.

1.02 RELATED REQUIREMENTS

A. Section 03 4900 - Glass-Fiber Reinforced Concrete: Exterior ornamental trim.

B. Section 04 7200 - Cast Stone Masonry: Exterior ornamental trim.

C. Section 06 1000 - Rough Carpentry: Supplementary supports for large items.

D. Section 06 8200 - Composite Trim.

E. Section 09 2116 - Gypsum Board Assemblies: Substrates for plaster fabrications.

F. Section 09 2300 - Gypsum Plastering: Substrates for plaster fabrications.

G. Section 09 2400 - Cement Plastering: Substrates for plaster fabrications.

H. Section 09 2613 - Gypsum Veneer Plastering: Substrates for plaster fabrications.

I. Section 09 9123 - Interior Painting: Field painting and sealing prior to painting.

1.03 REFERENCE STANDARDS

A. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.

B. ASTM C1355/C1355M - Standard Specification for Glass Fiber Reinforced Gypsum Composites; 2025.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including dimensions, finishes, storage and handling requirements and recommendations, and installation recommendations.

C. Shop Drawings: For custom items, provide drawings showing dimensions, layout, joints, details, fastening, and interface with adjacent work; include field measured dimensions of the spaces where items are to be installed, if critical to proper installation.

D. Samples: For each custom finish specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Transport, lift, and handle units with care, avoiding excessive stress and preventing damage; use appropriate equipment.

B. Store products in manufacturer's unopened packaging until ready for installation, in a clean dry area protected from weather, moisture and damage; store units upright and not stacked unless permitted by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass-Fiber-Reinforced Gypsum Fabrications:
   1. Armstrong World Industries; Plasterform GRG.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GYPSUM FABRICATIONS (INTERIOR USE ONLY)

A. Glass-Fiber-Reinforced Gypsum Fabrications: Molded glass fiber reinforced gypsum with structural reinforcing as required.
   1. Surface Burning Characteristics: Flame spread index of 0 (zero), smoke developed index of 10, maximum, when tested in accordance with ASTM E84.
   2. Surface Finish: Suitable for flat paint finish, without pinholes , voids, or roughness..
   3. Material Characteristics: Complying with ASTM C1355/C1355M.
   4. Items Too Large or Heavy to be Adhesively Installed: Provide concealed anchorage points for plaster type wire anchors.
   5. Glass Content: Minimum 5 percent by weight.
   6. Method of Construction: Hand or spray lay-up process in molds.
   7. Shell Thickness at Part Edges and at Fastening Points: 5/16 inch, minimum.
   8. Outside Corner Radius: 1/8 inch, maximum.
   9. Draft Angle: 3 degrees, minimum, on returns, setbacks, reveals, and grooves.
   10. Dimensional Tolerances of Molded Surfaces:
      a. Straightness: Maximum of 1/8 inch in 8 linear feet variation from straight at any point along any plane, edge, or surface.
      b. Overall Width and Length: Plus/minus 1/8 inch.

B. Joint Cement: Type recommended by fabrication manufacturer.

C. Joint Tape and Compound: Types recommended for gypsum wallboard work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect and wait for instructions before beginning installation.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install supplementary temporary and permanent supports as required for proper installation.

3.03 INSTALLATION

A. Install in accordance with applicable code and manufacturer's recommendations, plumb and true to line; shim where necessary.

B. Coordinate work with installation of substrates.

C. Join pieces with cemented butt joints except at control and expansion joints.

D. Provide control joints at not more than 35 feet on center if not indicated on drawings.

E. Provide expansion joints where moving joints in substrate occur.

F. Finish joints the same as specified for adjacent gypsum board work in Section 09 2116.

G. Finish joints and surfaces as required for Level 5 in ASTM C840.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Tile for floor and wall applications.

B. Tile for shower receptors.

C. Backer board as tile substrate.

D. Ceramic accessories, ceramic and non-ceramic trim.

E. Ceramic trim.

1.02 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2017.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

M. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.

N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

O. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.

P. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.

Q. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers. Have all materials to be used in installation at jobsite for observation.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details, and TCNA installation method details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations. Provide sample boards of tile color ranges for selection.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent of each size, color, and surface finish combinationbut not less than 10 of each type.

1.05 MOCK-UP

A. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Minimum size of mock-up is indicated on drawings.
   2. Approved mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Porcelain Mosaic Tile: ANSI A137.1, standard grade.
   1. Types as indicated on drawings.
   2. Manufacturers as indicated on drawings.

B. Glazed Wall Tile ANSI A137.1, standard grade.
   1. Types as indicated on drawings.
   2. Manufacturers as indicated on drawings.

C. Porcelain Tile: ANSI A137.1 standard grade.
   1. Types as indicated on drawings.
   2. Manufacturers as indicated on drawings.

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching ceramic shapes in sizes indicated.
   1. Types as indicated on drawings.
   2. Manufacturers as indicated on drawings.

2.03 SETTING MATERIALS

A. Provide setting materials made by the same manufacturer as grout.
   1. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
      a. Products:
         1) Custom Building Products; MegaLite Ultimate Crack Prevention Large Format Tile Mortar: www.custombuildingproducts.com/#sle.
         2) LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.
         3) Mapei Corporation:.

2.04 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: All locations.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. Custom Building Products; CEG-Lite: www.custombuildingproducts.com.
      b. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
      c. MAPEI Corporation.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors and Walls: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
   2. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber or Acrylic.
      b. Thickness: 25 mils, minimum, dry film thickness.
      c. Products:
         1) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
         2) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
         3) MAPEI Corporation; Mapelastic 400.

B. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber.
      b. Material: Acrylic.
      c. Thickness: 25 mils, minimum, dry film thickness.
      d. Products:
         1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
         2) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
         3) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.

4) USG Corporation; Durock Brand Liquid Waterproofing Membrane: www.usg.com/#sle.
5) Substitutions: See Section 01 6000 - Product Requirements.

2. Mortar Bonded Sheet Type:
   a. Material: PVC sheet membrane, 40 mils, thick, minimum.
   b. Material: Chlorinated polyethylene sheet membrane with polyester fabric laminated to both sides, 30 mils, thick, minimum.
   c. Products:
      1) COMPOTITE Corporation; Composeal 40 mil Blue: www.compotite.com/#sle.
      2) LATICRETE International, Inc; LATICRETE HYDRO BAN Sheet Membrane: www.laticrete.com/#sle.
      3) Noble Company; NobleSeal TS: www.noblecompany.com/#sle.
      4) _____.
      5) Substitutions: See Section 01 6000 - Product Requirements.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

D. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
   1. Standard Type: Thickness 1/2 inch.
   2. Fire Resistant Type: Type X core, thickness 5/8 inch.

E. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

F. Self Leveling underlayment System: Cement based underlayment and primer.
   1. Laticrete International; Level & Primer: www.laticrete.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances. Use self-level

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of color as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installation.

F. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protect coating, taking care not to coat unexposed tile surfaces.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings, unless otherwise noted.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Miter wall tiles at outside corners.

E. Jointing Pattern: Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
   1. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Layout tile work and center tile fields in both directions in each wall area.
   2. Adjust tile to align with expansion joints in slabs and to minimize tile cutting.
   3. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Expansion Joints: Locate sealant filled expansion control, contraction and isolation joints directly over existing joints during installation of setting materials, mortar beds and tile, except where permitted otherwise. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete surfaces or provide crack isolation membrane to realign joint. Reference details on drawings.
   2. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

G. Cap tile wainscots with bullnose trim matching wall tile. If bullnose trim is not available, provide aluminum trim or as indicated on drawings.

H. Form internal angles square and external angles bullnosed.

I. Install ceramic accessories rigidly in prepared openings.

J. Install non-ceramic trim in accordance with manufacturer's instructions.

K. Sound tile after setting. Replace hollow sounding units.

L. Keep control and expansion joints free of mortar, grout, and adhesive.

M. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

N. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

O. Grout tile joints. Grout to comply with ANSI A108.10 tile installation standards.

P. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

Q. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes. Apply sealant at corners of intersecting tile surfaces.

3.04 INSTALLATION - FLOORS & WALLS - WATERPROOF & CRACK-SUPPRESSION MEMBRANE

A. Install waterproofing and crack-suppression membrane to comply with ANSI A108.13 and membrane manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing and crack suppression membrane until membrane has cured and been tested to determine that it is water tight.

C. Install waterproofing and crack suppression membrane below all ceramic tile at locations indicated. Note full-coverage embedded fabric reinforcement required regardless of manufacturer / product used.
   1. Provide at Shower Rooms, toilet rooms, restrooms, laundry rooms, janitor closets, kitchens and/or similar wet locations scheduled to receive tile.

D. Install waterproofing membrane underneath prefinished plumbing fixtures and/or units such as shower pans, shower units, hot tubs, toilets, mop sinks, sink basins, or similiar large floor mounted fixtures. Membrane to seal tight to all floor penetrations and piping to create complete waterproof assembly.

E. Install waterproofing membrane vertically on all walls a minimum of 4 inches around entire perimeter of rooms. Extend membrane vertically on wall surfaces beneath wall tile of showers and pre-made shower units to ensure water tight system.

3.05 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over exterior concrete substrates, install in accordance with TCNA (HB) Method F102, with epoxy grout.

B. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F122, using waterproof membrane, thin-set latex-portland cement bond coat with epoxy grout.

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. Grout with standard grout as specified above.

3.07 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with The Tile Council of North America Handbook Method W244, thin-set over cementitious backer units, with waterproofing membrane, with epoxy grout.

B. Over interior walls on cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244using membrane where indicated, thin-set latex-Portland cement bond coat with epoxy grout.

C. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202, thin-set with dry-set or latex-Portland cement bond coat on waterproof membrane where indicated, with epoxy grout.

D. At glass tile installations: Over interior walls on cementitious backer units, install in accordance with the TCNA Handbook method W244C using white Glass Tile Adhesive with epoxy grout. Verify tile adhesive with glass tile manufacturer.

3.08 CLEANING

A. Clean tile and grout surfaces.

B. Clean and remove all residue from epoxy grout from surfaces of tile. Use professional cleaning solutions as required.

3.09 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed. Provide at a minimum 1 box or carton of ceiling tile.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Rockfon; https://www.rockfon.co.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
   1. Size: As indicated on drawings.
   2. Panel Edge: Square. A24
   3. Color: White.
   4. Suspension System: Exposed grid.
   5. Products: As indicated on drawings.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System, Type ____: Hot-dipped galvanized steel grid with aluminum cap; factory-applied closed-cell foam gaskets.
   1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
   2. Basis of Design: As indicated on drawings
   3. Profile: Tee; 15/16 inch face width.
   4. Finish: Baked enamel. White.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

D. Acoustical Insulation: Specified in Section 07 2100.
   1. Thickness: 2 inch.
   2. Size: To fit acoustical suspension system.

E. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

F. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9005.

G. Touch-up Paint: Type and color to match acoustical ceiling tiles and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Coordinate and verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
1. Make field cut edges of same profile as factory edges.
2. Double cut and field paint exposed reveal edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. At partitions that extend only to underside of ceiling grid, lay acoustical insulation for a distance of 48 inches either side of acoustical partitions.

H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6340
STONE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stone on floors.

B. Stone setting and grouting.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide instructions for using grout.

C. Shop Drawings: Indicate stone layout.

D. Samples: Submit sample of colored grout.

E. Samples: Submit stone samples.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
   1. Include list of liquids detrimental to appearance of stone finish.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with TCNA (HB) instructions for methods specified.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.04 MOCK-UP

A. Construct 1 mock-up, 2 feet long by 2 feet wide, illustrating stone, finish grout, and specified accessories.

B. Locate where indicated on site by Architect.

C. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 STONE

A. ST-1: Marble Flooring: Free of defects detrimental to appearance or durability; ASTM C503/C503M Classification I - Calcite:
   1. Basis of Design: As indicated on drawings.

B. ST-2: Marble Border: Free of defects detrimental to appearance or durability;ASTM C503/C503MClassification I - Calcite:
   1. Basis of Design: As indicated on drawings.

2.02 SETTING AND GROUTING MATERIALS

A. Provide mortars, grouts, membrane, caulk, sealer, and cleaner as recommended in stone manufacturer's installation instructions.

B. Provide setting and grout materials from same manufacturer.

2.03 ACCESSORIES

A. Thresholds: As indicated on drawings.

B. Cleaner: Type not harmful to stone, joint materials, or adjacent surfaces; recommended by stone producer and grout manufacturer.

C. Sealer: Colorless, slip and stain resistant type that will not detrimentally affect stone and adjacent work.

2.04 MORTAR AND GROUT MIX

A. Mix and proportion pre-mixed setting bed and grout materials in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive this work.

3.02 PREPARATION

A. Vacuum clean substrate surfaces; damp clean stone.

B. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

C. Clean stone prior to installation, with edges and surfaces free of dirt or foreign material.

D. Do not use wire brushes or implements that mark or damage exposed surfaces.

3.03 INSTALLATION - GENERAL

A. Lay stone units to pattern indicated, and do not interrupt pattern through openings.

B. Place thresholds at door frame openings.

C. Cut and fit stone units tightly to penetrations, leaving sealant joint space. Ensure finish trim will cover cut edges. Form corners and bases neatly. Align floor and base joints.

D. Maintain uniform joint width subject to variance in tolerance allowed in stone unit size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

E. Maintain joint width of 1/4 inch where abutting vertical surfaces or protrusions.

F. Sound test the units after setting. Replace hollow sounding units.

G. Keep expansion and control joints free of mortar or grout. Apply sealant to joints.

H. Grout joints. Pack and work grout into voids. Neatly tool to flush surface.

3.04 CLEANING

A. Clean stone and grout surfaces with cleaner; seal with sealer.

END OF SECTION

SECTION 09 6429
WOOD STRIP AND PLANK FLOORING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Wood strip and plank flooring, nailed.

1.02 REFERENCE STANDARDS

A. NWFA (IG) - Installation Guidelines; current edition located at www.nwfa.org.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for flooring and floor finish materials.

C. Shop Drawings: Indicate floor joint pattern, termination details, indicate provisions for expansion and contraction.

D. Samples: Submit two samples ___ by ___ inch in size illustrating floor finish, color, and sheen.

E. Installation Instructions: Indicate standard and special installation procedures.

F. Maintenance Data: Include maintenance procedures and recommended maintenance materials.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with NWFA (IG).

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 FIELD CONDITIONS

A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hardwood Strip and Plank Flooring:
   1. Mirage Floors :www.miragefloors.com.

2.02 MATERIALS

A. Wood Strip Engineered Flooring - Type WD-1:
   1. Basis of Design: As indicated on drawings.
   2. Installation Pattern: As indicated on drawings.

B. Flooring Nails: Type recommended by flooring manufacturer.

C. Vapor Retarder: Black polyethylene sheet, 8 mil thick; 2 inch wide tape for joint sealing.

D. Fasteners:
   1. Flooring: Zinc Plated, 1-1/2 inch Phillips head, steel screws.
   2. Sub-floor: Galvanized steel screws; length for full wood penetration, but not to exit on underside of sleeper.
   3. Channel anchors at wood floor: Zinc plated, 1-1/4 inch pan head, steel screws.
   4. Channel anchors to concrete: 1-1/4 inch pneumatic or powder-actuated concrete anchor.

2.03 ACCESSORIES

A. Wood Base: Same species as flooring; profiles as indicated on drawings.

B. Transition Strip: Same species and finish as flooring material; profiles indicated.

2.04 SOURCE QUALITY CONTROL

A. Inspect and stamp species and grade on underside of each piece of wood flooring at factory.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet.

C. Verify wood subfloor is properly secured, smooth and flat to plus or minus 1/4 inch in 10 feet.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare substrate to receive wood flooring in accordance with manufacturer's and NWFA instructions.

B. Broom clean substrate.

3.03 INSTALLATION

A. Wood Flooring:
   1. Install in accordance with manufacturer's and NWFA instructions; predrill and blind nail to subfloor.
   2. Lay flooring parallel to length of room areas. Verify alignment as work progresses.
   3. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar; provide divider strips and transition strips in accordance with flooring manufacturer's recommendations and as indicated.
   4. Install edge strips at unprotected or exposed edges, and where flooring terminates.
   5. Secure edge strips before installation of flooring with stainless steel screws.
   6. Install flooring tight to floor access covers.
   7. Provide 3/8" inch expansion space at fixed walls and other interruptions.

B. Install base at floor perimeter to cover expansion space in accordance with manufacturer's instructions. Miter inside and outside corners.

3.04 CLEANING

A. Clean and polish floor surfaces in accordance with floor finish manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Resilient tile and sheet flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).

C. ASTM F1700 - Standard Specification for Solid Vinyl Tile; 2013a.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

F. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015.

G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

H. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

I. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

J. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Mockup: may be required from installer to convey installation of componets with accessories.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 percent or 45 square feet of each type and color.
   3. Extra Wall Base: 20 linear feet of each type and color.

4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off of the floor in an acclimatized, weather-tight space.

B. Protect roll materials from damage by storing on end.

1.06 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Luxury Vinyl Plank Flooring - LVT-1: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturer: As indicated on drawings.
   2. Basis of Design: As indicated on drawings.
   3. Installation Pattern: 1/3 Running Bond / Stagger
   4. Installation Method: Direct Glue

2.02 STAIR COVERING

A. Stair Nosings
   1. Basis of Design: As indicated on drawings.

2.03 RESILIENT BASE

A. Resilient Base - RB1 and RB2
   1. Manufacturers: As indicated on drawings.
   2. Basis of Design: As indicated on drawings

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Leveling and Patching compound: As recommended by flooring manufacturer.

C. Moisture Membrane: As required or recommended by flooring manufacturer.

D. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer based on application type.
   1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.
   2. Provide product compatible with concrete subfloor relative humidity and ph levels.
   3. Provide products as recommended by flooring manufacturer.
   4. Use epoxy adhesive by flooring manufacturer for wet locations as indicated on drawings as Type **LVT-1 (EA)**

E. Moldings, Transition and Edge Strips: As indicated on drawings.

F. Filler for Coved Base: Plastic.

G. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates have fully cured and ready for resilient flooring installation by testing for moisture, pH and compression strength.
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
   3. Verify cementitious sub-floor and any fillers have reached minimum 3000 psi strength.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers. Remove curing compounds, surface hardeners or other chemicals that may interfere with adhesive bonding. Where subfloor moisture levels are higher than acceptable installation range, prepare or condition space as necessary to permit installation. The use of moisture barrier membrane is acceptable.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.
   3. Fit joints and butt seams tightly.
   4. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door. Where flooring is similar, continue seamlessly through opening.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Provide nosings at corners of floor plane transtions such as at steps..

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

G. Install flooring in recessed floor access covers, maintaining floor pattern.

H. At movable partitions, install flooring under partitions without interrupting floor pattern.

I. Install feature strips where indicated.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install tile to match patterns as indicated on drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Use coil stock when available and install in longest runs with minimal joints possible.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Seal and Wax resilient flooring with two coats and/as recommended by manufacturer. For products that do not require wax, provide temporary protection until project completion.

END OF SECTION

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber sheet flooring, adhesively installed.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Rubber Flooring Direct: www.rubberflooringdirect.com.

B. Rubber Sheet Flooring: RF-1; Recycled SBR (styrene butadiene rubber) and colored EPDM granules with urethane binder, lengths to avoid transverse seams.
   1. Basis of Design: Rubber Flooring Rolls
   2. Thickness: Minimum 1/2 inch.
   3. Sheet Width: Minimum 48 inches.
   4. Color: Black.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

3.02 PREPARATION

A. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6700
FLUID-APPLIED FLOORING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fluid-applied flooring and base with integral color patterns.

1.02 REFERENCE STANDARDS

A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum five years of documented experience.

1.05 MOCK-UP

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.
   4. Minimum Size: 48 inches by 48 inches.

B. Obtain approval of mock-up by Architect before proceeding with work.

C. Approved mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Flooring:

1. Desco; Quartz Cremona: www.descocoating.com.;

2.02 FLUID-APPLIED FLOORING SYSTEMS

A. Epoxy Flooring EPX-1: Epoxy, two component, thermosetting, colored with mineral filler, with aggregate embedded in base coat.
   1. Base Coat: 1/8 inch thick; color as selected.
   2. Aggregate: Small quartz chips, multiple colors as selected.
   3. Top Coat: Epoxy, single component, thermosetting; 1/8 inch thick; clear.
   4. Tensile Strength: 2,500 psi, when tested in accordance with ASTM D638.
   5. Compressive Strength: 12,000 psi, when tested in accordance with ASTM D695.
   6. Mildew Resistance: No growth.
   7. Color: As indicated on drawings.
   8. Basis of Design Product: Desco Quartz Cremona TG.

2.03 ACCESSORIES

A. Base Caps & Flooring Trim: Extruded anodized aluminum with projecting base of 1/8 inch; color as selected.

B. Cant Strips: Molded of flooring resin material.

C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Internal Relative Humidity: ASTM F2170.
   2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Apply primer or concrete slab moisture humitidy sealer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Install cant strips at base of walls where flooring is to be extended up wall as base.

B. Install terminating cap strip at top of base and at door thresholds; attach securely to substrate.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness indicated.

C. Finish to smooth level surface.

D. Install raised water dam bump around perimetes of showers.

E. Cove at vertical surfaces.

F. Seal perimeter of base cap against wall surface.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL V.23

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels, ledge angles, and exterior primed or unfinished metals.
   2. Mechanical and Electrical:
      a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
   7. Floors, unless specifically indicated.
   8. Ceramic and other types of tiles.
   9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Exterior insulation and finish system (EIFS).
   11. Glass.
   12. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five (5) years experience.

C. Provide field testing for adhesion per ASTM D4551 for paint applied to steel and galvanized steel surfaces in locations directed by Architect, quantity of 2 locations.

1.05 MOCK-UP

A. Locate where directed by Architect.

B. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.08 WARRANTY

A. See section 01 7800 for CLOSEOUT SUBMITTALS, for additoinal warranty requirements.

B. Manufacturers Requirements: Provide standard manufacturers warranty.

C. Installers Requirements: Provide guarentee that surface cleaning and preparation has been performed as specified and that product(s) specified have been used at specified application. Provide 5 year warranty for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin Williams.
   2. Behr Process Corporation: www.behr.com/#sle.
   3. PPG Paints: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated in Color Schedule.
   1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer, all side of wood surfaces.
   2. On backside of concealed wood trim: One coat of latex primer sealer.
   3. Semi-gloss: Two coats of latex enamel.

B. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
   1. One coat of block filler. Sherwin Williams Loxon Block Surfacer A24W200, coordinate requirements with coating manufacturer.
   2. Concrete and Masonry Coatings per Section 09 9723.

C. Paint GE-OP-3L - Exterior Gypsum Board and Exterior Plaster, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer. Loxon Concrete & Masonry Primer Sealer, A24W8300
   2. Flat: Two coats of latex; A-100 Exterior Latex Flat, A6 Series.

D. Paint ME-OP-3A - Ferrous Metals, Unprimed, Acrylic, 3 Coat:
   1. One coat of acrylic primer. Sherwin Williams B66-310 Series
   2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.

E. Paint ME-OP-3B - Ferrous Metals, Unprimed, Acrylic, 2 Coat: Exposed Exterior Structural Steel
   1. Touch Up of manufacturer acrylic primer: As reccommended by Tnemec
   2. Semi-gloss: Two coats of HDP acrylic enamel; Tnemec Enduratone Series 1029.

F. Paint ME-OP-2A - Ferrous Metals, Primed, Acrylic, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.

G. Paint MgE-OP-3A - Galvanized Metals, Acrylic, 3 Coat:
   1. One coat galvanize primer.
   2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.

H. Paint MgE-OP-3X - Exterior Metal Handrails & Door Frames, Acrylic, 3 Coat:
   1. One coat ProCryl Universal Primer B66-310 Series.
   2. Semi-gloss: Two coats of DTM acrylic enamel; Sherwin Williams B66-200 Series.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Exterior Plaster and Stucco: 12 percent.
   2. Fiber Cement Siding: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

I. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

J. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

L. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

G. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide mock-up on-site of each paint color selected by Architect, minimum 3 feet long by 3 feet wide, in location as directed by Architect. Colors to be reviewed by Architect for final approval PRIOR to starting painting. Proceeding with painting without approval is done so at Contractor's own risk.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate where directed by Architect.

E. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin Williams Company.
   2. Behr Process Corporation: www.behr.com/#sle.
   3. Pittsburgh Paints: www.ppgpaints.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Block Fillers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Colors: As indicated on drawings.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer. PrepRite ProBlock Latex Primer Sealer B51 Series
   2. Semi-gloss: Two coats of latex enamel; Pro Industrial Acrylic Semi Gloss B66-650 Series.

B. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of acrylic primer. ProCryl Universal Primer B66-310 Series
   2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi-Gloss B66-650 Series.

C. Paint MI-OP-2A - Ferrous Metals, Primed, Acrylic, 2 Coat:
   1. Touch-up with recommended primer.
   2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi Gloss B66-650 Series.

D. Paint MI-OP-2L - Ferrous Metals / Roof Deck / Exposed Interior Structure, Primed, Latex, 2 Coat:
   1. Touch-up with recommended primer. Pro-Cryl B66-310 Series
   2. Semi-gloss: Two coats of water borne acrylic dryfall Pro Industrial Semi Gloss B42-80 Series. .

E. Paint CI-OP-3E - Concrete/Masonry, Epoxy Enamel, 3 Coat:
   1. One coat of catalyzed epoxy primer. Loxon Block Surfacer A24W200
   2. Gloss: Two coats of catalyzed epoxy enamel: Full Gloss. Pro Industrial Precatalyzed Gloss Epoxy B73-300 Series .

F. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of alkyd primer sealer. ProMar 200 Primer B28W2600 Series
   2. Semi-gloss: Two coats of latex enamel.
   3. Eggshell: Two coats of latex enamel; ProMar 200 B20-2600 Series.
   4. Flat: Two coats of latex enamel; B30-2600 Series (ceilings).

G. Paint GI-OP-3M - Gypsum Board/Plaster, Epoxy Enamel, 3 Coat:
   1. One coat of latex primer sealer. ProMar 200 Latex Primer B28W2600 Series
   2. Gloss: Two coats of water based catalized epoxy enamel; Pro Industrial Epoxy B73-300 Series.

H. Paint FI-OP-3A - Fabrics/Insulation Jackets, Alkyd, 3 Coat:
   1. One coat of alkyd primer sealer.
   2. Eggshell: Two coats of alkyd enamel.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

L. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, ____x____ inch in size.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide finishes from the same manufacturer to the greatest extent possible.

B. Transparent Finishes:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. Pittsburgh Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com/#sle.
   3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Stains:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. Pittsburgh Paints Deft Interior Stains: www.ppgpaints.com/#sle.

3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide stains and transparent finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Vertical Surfaces:
   1. 2 coat(s) varnish over 2 coat(s) stain, or as required by manufacturer instructions.
   2. Stain: Semi-Transparent Stain for Wood, Water Based; MPI #186.
      a. Products:
         1) Pittsburgh Paints Deft Interior Water-Based Wood Stain, DFT300 Series. (MPI #186)
         2) Sherwin-Williams MinWax 250 VOC Oil Wood Stain _____.
         3) Substitutions: Section 01 6000 - Product Requirements.
   3. Top Coat(s): Polyurethane Varnish, High Build.
      a. Products:
         1) Sherwin-Williams MinWax High Build Polyurethane, Semi-Gloss.
         2) Substitutions: Section 01 6000 - Product Requirements.

B. Finish on Wood - Floors.
   1. 2 coat(s) varnish over 2 coat(s) stain or as required by manufacturer's instructions.
   2. Stain: Semi-Transparent Stain for Wood; MPI #90.
      a. Products:
         1) Pittsburgh Paints Deft Interior Oil-Based Fast Dry Stain, DFT570 Series. (MPI #90)
         2) Pittsburgh Paints Deft Interior Oil-Based Wood Stain, DFT400 Series. (MPI #90)
         3) Sherwin-Williams MinWax 250 VOC Oil Stain. (MPI #90)
         4) Substitutions: Section 01 6000 - Product Requirements.
   3. Top Coat(s): Polyurethane Varnish, High Build.
      a. Products:
         1) Sherwin-Williams MinWax High Build Polyurethane, Gloss.

2) Substitutions: Section 01 6000 - Product Requirements.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

E. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

F. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Reinstall items removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 09 9725
MINERAL-BASED COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mineral-based coatings.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films; 2013.

B. ASTM D6904 - Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry; 2003 (Reapproved 2013).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials and _____.

C. Samples: Submit two samples ____ by ____ inch in size illustrating colors for selection.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum _____ years documented experience and approved by manufacturer.

1.06 MOCK-UP

A. Provide mock-up of _____, ____ feet long by ____ feet illustrating color, texture, and quality of work .

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not install materials when temperature is below 41 degrees F or above 113 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 48 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mineral-Based Coatings:

1. KEIM Mineral Coatings of America, Inc; KEIM Mineral Masonry Paint: www.keim-usa.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MINERAL-BASED COATINGS

A. Provide mineral-based coating systems that meet the following minimum performance criteria:
   1. Water Vapor Permeance Rate: _____ perms when tested according to ASTM D1653, method B.
   2. Wind Driven Rain Resistance: Passing, when tested according to ASTM D6904 at 98 miles per hour for 24 hours.

2.03 MATERIALS

A. General:
   1. Provide mineral-based coatings formulated to chemically bond with the substrate to produce a water-repellent, vapor permeable, fire retardant finish.
   2. Maximum Volatile Organic Compound (VOC) Content: As required by applicable regulations.

B. Paint: Water and potassium silicate based paint with earthen and mineral pigments and fillers; quartz binder.
   1. Dilute with 10 percent, maximum, mineral-based primer/thinner.
   2. Color: As indicated on drawings.
   3. Products:
      a. KEIM Mineral Coatings of America, Inc; KEIM Mineral Masonry Paint: www.keim-usa.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Primer/Thinner: Water and potassium silicate based primer with acrylate stabilizer. Use as recommended by coating manufacturer to stabilize loose or powdery mineral surfaces, to condition unevenly or highly absorbent surfaces, or as a thinner for silicate coatings.
   1. Products:
      a. KEIM Mineral Coatings of America, Inc.; KEIM Exterior Mineral Bonding Primer: www.keim-usa.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 4 percent.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Existing Painted and Sealed Surfaces:
   1. Strip existing paint and coatings from surface.
   2. Remove loose, flaking, and peeling paint.
   3. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

C. Protect adjacent surfaces and materials not receiving coating from splatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Prior to priming, patch holes and indentations and fill cracks with manufacturer's recommended crack repair material.

B. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

C. If surface is highly absorbent, apply second coat of primer. Allow to dry 8 hours, minimum, before recoating.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions.

B. Apply coatings evenly and allow to soak into substrate. Allow to dry 12 hours, minimum, before recoating.

3.05 CLEANING

A. Clean surfaces immediately of overspray, splatter, and excess material.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building Signage

E. Plaque.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2009.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through WER Architects at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through WER Architects prior to fabrication.

D. Samples: Submit one sampleof sign type F and H , of size similar to that required for project, illustrating sign style, font, and method of attachment.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:

B. Plaques:

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

1. Sign Type: Flat signs with engraved panel media as specified.
2. Material: Round-Corner non-glare plec top peice (P-99), layers together equally approx. 1/4 inch thick with printed second surface (artwork indicated on drawing)
3. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
4. Character Height: minimum 5/8 inch.
5. Sizes: As indicated on drawings.
6. Office & Classroom Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Interior Directional and Informational Signs:
1. Sign Type: Same as room and door signs.
2. Sizes: As indicated on drawings.
3. Wording of signs is scheduled on drawings.

D. Emergency Evacuation Maps:
1. Allow for one map per elevator lobby and classroom wing (total of 7)
2. Map content to be provided by Owner.
3. Include Middle School Evacuation sign.

E. Plaque: See drawings for details.

F. Building Signage: See drawings for details

2.03 PLAQUES

A. Metal Plaques:
1. Metal: Aluminum casting.
2. Metal Thickness: 1/8 inch, minimum.
3. Text and Typeface:
   a. Character Font: Montserrat, Raised Satin Finish.
4. Border Style: As indicated on drawings.
5. Background Texture: Sand. - black
6. Mounting: Blind studs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

1.05 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.

C. Installer Warranty: Provide 5-year warranty for metal crash rails commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: Wood
   2. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   3. Width of Wings: 2 inches , unless otherwise indicated in drawing details.
   4. Corner: Square.
   5. Color/Finish: Painted to match adjacent wall finish.
   6. Length: One piece.
   7. Height: Full height.
   8. Locations: Outside corners as indicated on finish plans.

B. Protective Wall Panels:
   1. Manufacturers:
      a. Panolam Surface Systems
      b. Substitutions: See Section01 6000-Product Requirements.
   2. Material: Fiber Reinforced Plastic (FRP)
   3. Thickness: 0.075 inch.
   4. Panel Size: 4 feet by 8 feet.

5. Color and Pattern: As indicated on drawings.
6. Texture: As indicated on drawings.
7. Accessories: Provide manufacturer's standard PVC color-matched trim and moldings.
    a. Outside Corner Trim: Flat.
    b. Division Bar: Flat.
8. Mounting: Adhesive.

2.02 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to ____ inches high.

C. Position protective wall covering at top of scheduled wall base
1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
4. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
5. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
6. Use a roller to ensure maximum contact with adhesive.
7. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.02 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Residential toilet, shower, and bath accessories.

D. Utility room accessories.

1.02 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

B. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

C. Adhesive: Two component epoxy type, waterproof.

D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.02 TOILET ACCESSORIES

A. Toilet Paper Dispenser **(TA-1)**: Double Roll, surface-mounted
   1. Products: Aplusee Wall Mounted Toilet Paper Holder
      a. Product: ABUS1027 / A8912PG4
      b. Finish: Gold

B. Grab Bars **(TA-7)**:
   1. Products: Kohler Purist
      a. Finish: Vibrant Brushed Moderne Brass
      b. 42" Grab Bar: K-11896-2MB
      c. 36" Grab Bar: K-11895-2MB
      d. 18" Grab Bar: K-11892-2MB

C. In-Cabinet Trash Bin: (**TA-12**):

1. Product: Lavex 23 Gallon Gray Square Trash Can
2. Size: 23 gallon; 16" x 16" x 30" H
3. Color: Gray
4. Item #: 475sq23gy
5. Weblink:

2.03 SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod **(TA-13)**:
   1. Products: Kohler Elate
   2. K-33810-2MB
   3. Finish: Vibrant Brushed Moderne Brass

B. Shower Curtain Rod ADA (**TA-13B**):
   1. Products: Soctan, The Shower Curtain Rod 34-96 Inches
   2.
   3. Finish: Gold

C. Robe Hook **(TA-15)**:
   1. Products: Etsy, Brass Leaf Wall Hook: Nordic Coat/Towel Hanger
   2. Finish: Gold
   3. Website Link: https://www.etsy.com/listing/1716996418/brass-leaf-wall-hook-nordic-coattowel?ref=collection_page&pro=1

2.04 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder **(MBH-1)**: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Provide one at each mop sink, typical.
   2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches.
   5. Products: B239 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Mirrors: _____ inch, measured from floor to bottom of mirrored surface.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 2819
TUB AND SHOWER ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Frameless shower doors and hardware.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's literature for enclosure.

C. Shop Drawings: Indicate layout, dimensions, identification of components, and interface with adjacent construction.

D. Verification Samples: 1 samples, minimum size of 2 by 3 inches, representing actual material and finish of exposed glass.

E. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade in manufacturer's unopened packaging until installation.

1.06 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty against structural failure and excessive degradation of metal finishes. Complete forms in Owner's name and register with manufacturer.

C. Manufacturer Warranty: Provide 30-year manufacturer warranty against defects in workmanship or material. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Frameless shower doors and hardware:
   1. CR Laurence https://www.crlaurence.com.

2.02 FRAMELESS SHOWER DOORS HARDWARE - GENERAL

A. Patch Fittings for Frameless Enclosures: Hinges and Glass mounts.
   1. Edge Profile: Square.
   2. Mounting: Clamp, with set screw, no hole in glass..

3. Basis of Design: CRL Trento Offset Back Plate Hinge; CRL TNT
    a. Finish: Satin Brass

B. Concealed Fasteners: Manufacturer's standard stainless steel.

C. Door Pull: CRL Back to Back Solid Diameter Pull Handles without Metal Washers.
1. Basis of Design: CRL BPD8SB
2. Finish: Satin Brass

D. Provide swinging doors with a continuous drip rail and wiper blade at bottom of panel. Attach drip rail adhesively with transparent double-sided tape with no exposed screws.
1. Basis of Design: CRL P956WS; CRL Clear Co Extruded Bottom Wipe with Drip Rail
2. Finish: Clear

2.03 FRAMELESS SHOWER DOORS GLASS - GENERAL

A. Configuration: As noted on drawings.

B. Shower Door Height: 84"

C. Door or Opening Width: As indicated on the drawings.

D. Head Condition: No header with exposed top glass edge.

E. Frameless Glass Doors:
1. Door Glass Thickness: 3/8 inch, tempered.
2. Sill Condition: Vinyl sill.

2.04 MATERIALS

A. Tempered Glass: Annealed clear flat glass meeting requirements of ASTM C1036, Type I, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
1. Comply with 16 CFR 1201, Category 2 and ANSI Z97.1.
2. Thickness: As indicated in enclosure and door types above.
3. Prepare glazing panels for indicated fittings and hardware before tempering.
4. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.
5. Products:
    a. Guardian Glass, LLC; ShowerGuard: www.guardianglass.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

B. Sealant: One-part mildew-resistant silicone sealant, complying with ASTM C920, clear.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Do not begin installation until supports and adjacent substrates are complete.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates as recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. Fit and align tub and shower enclosure level and plumb.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Verify enclosure does not leak while shower is running and door is fully closed and catch is engaged.

3.05 ADJUSTING

A. Adjust tub and shower enclosure doors to operate smoothly.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove protective film and temporary stickers from exposed metal and glass surfaces.

C. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

D. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for closeout submittals.

3.08 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 4116
EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Emergency key cabinets and supplementary items necessary for installation.

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturers technical literature for each product and system indicated.
   1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Samples for Verification Purposes: 3 inch square sample of exposed metal to indicate compliance with finish specified.

1.03 QUALITY ASSURANCE

A. Local Authority Approval: Obtain approval of local fire department for keyway access and exact location and type of emergency key cabinet mounting prior to Product Data submittal.

B. Emergency key cabinet will be required at building entrance(s) designated by the fire department or at the building's fire control room; as appropriate.

1.04 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

1.05 ENVIRONMENTAL CONSIDERATIONS

A. This project is designed and constructed with practices and procedures to meet the project's environmental considerations and goals. These considerations and goals are to establish a facility which is environmentally responsible, profitable, and a healthy place to live and work. To guide this process, this project is using guidance from the LEED v4 rating system. The project is not pursuing certification. All team members will be required to perform some amount of associated documentation. Refer to Sections listed below for environmental considerations and goals, and applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.
   1. Knox Company.

2.02 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.03 EMERGENCY KEY CABINET

A. Product Standard: Knox Company; Knox-Box 3200 Series Hinged or Lift-Off Door Model, as required by local jurisdiction. 1/4 inch thick steel plate housing, 1/2 inch thick steel door with interior gasket seal and stainless steel door hinge. Box and lock shall be UL Listed.
   1. Lock shall have 1/8 inch thick stainless steel dust cover with tamper seal mounting capability.
   2. Lock shall have double-action rotating tumblers and hardened steel pins accessed by a biased cut key.
   3. Coordinate other necessary requirements with local fire department.

4. Provide UL Listed alarm tamper switches as required by local fire department.

B. Size: One of the following, recessed or surface mount; as indicated on drawings:
   1. Recessed Mount: 7 inch wide by 7 inch high by 3 inch deep.
      a. Provide manufacturers standard recessed mounting kit (RMK) including shell housing and mounting hardware for cast-in construction.

C. Finish: Manufacturers standard weather resistant polyester powder coat.
   1. Color: As selected by Architect from manufacturers standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.02 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
   1. Respective manufacturers written installation instructions.
   2. Accepted submittals.
   3. Contract Documents.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

3.03 PREPARATION

A. General: Comply with manufacturers instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.04 INSTALLATION OF EMERGENCY KEY CABINETS

A. Install in accordance with manufacturer's latest published requirements.

B. Recess Mount Units: Securely attach recessed mounting kit within cast-in wall construction. Shell housing box shall be flush with face of finished wall and plumb and level to ensure vertical alignment of box.

C. Tamper Switches: Install switches, including control wiring, as follows:
   1. Refer to Division 26 Sections for connection to electrical power distribution system.
   2. Coordinate tamper switches with building security system.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
   2. Pyro-Chem, a Tyco Business: www.pyrochem.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Stored Pressure Operated: Deep Drawn.
   2. Class: A:B:C type.
   3. Size: 10 pound.
   4. Temperature range: Minus 65 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Configuration: _____Recessed, Semi-Recessed, and bracket type, coordinate with wall cavity depth.
   1. Size to accommodate accessories.

B. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

C. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

E. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish. Painted to match adjacent wall finish.

F. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions per NFPA and ADA standards.
   1. Handle for Fire Extinguisher Cabinet shall not be installed higher than 52" above finished floor.
   2. The top of the Fire Extinguisher mounted inside of Cabinet shall not be higher than 60" above finished floor.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

END OF SECTION

SECTION 11 4000
FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foodservice equipment.
   1. See following pages for foodservice equipment cut sheets.

B. Connections to utilities.

PART 2 PRODUCTS

END OF SECTION

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 1 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: ECC-2472
Description: WIRE SHELVING UNIT

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½"	☐ ¾"	☐
Hot Water	½"	☐ 3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐ 1"	☐
Return:	½"	☐ 1"	☐

Description / Accessories:

Reviewer's Stamp:

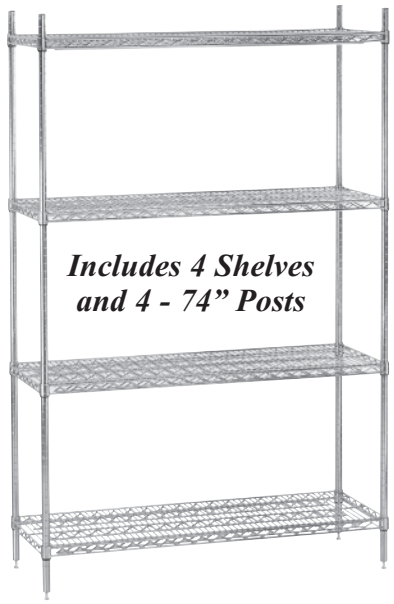
CHROME or GREEN EPOXY COATED

WIRE SHELVING COMBO

Item #: _____ Qty #: _____

Model #: _____

Project #: _____





FEATURES:

Each shelf holds up to 800 lbs. evenly distributed weight.
NSF approved.
Posts are numbered for easy assembly and are included.

CONSTRUCTION:

Unit assembles using tapered split sleeves.

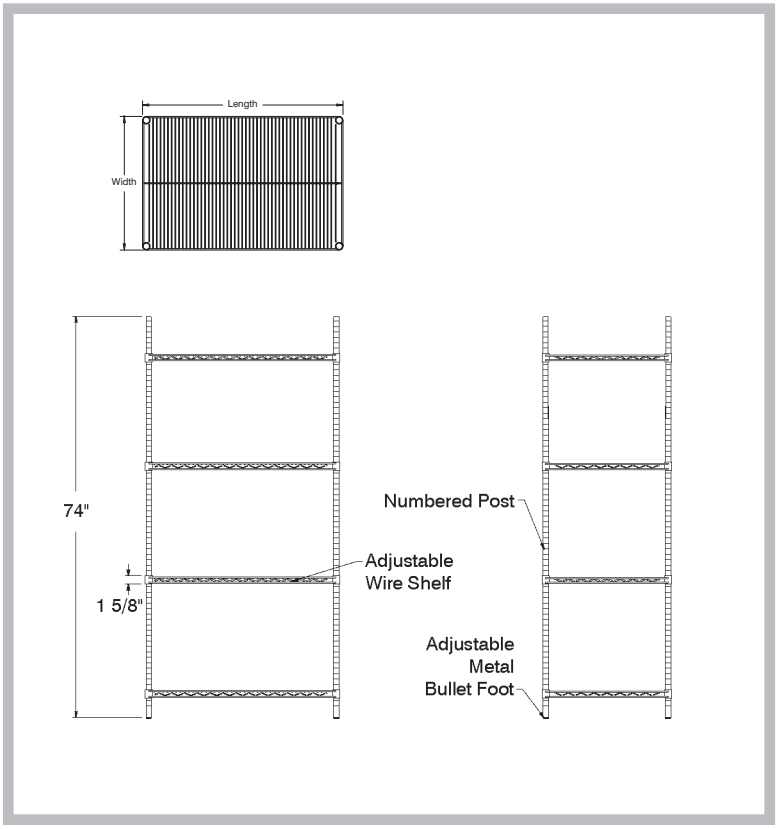
MATERIAL:

Chrome plated or green epoxy coating.

DIMENSIONS and SPECIFICATIONS

TOL ± .500" ALL DIMENSIONS ARE TYPICAL

CHROME MODEL #	GREEN EPOXY COATED MODEL #	Shelf Size	Weight
ECC-1436	EGG-1436	14" x 36"	64 lbs.
ECC-1442	EGG-1442	14" x 42"	69 lbs.
ECC-1448	EGG-1448	14" x 48"	75 lbs.
ECC-1460	EGG-1460	14" x 60"	93 lbs.
ECC-1472	EGG-1472	14" x 72"	107 lbs.
ECC-1836	EGG-1836	18" x 36"	68 lbs.
ECC-1842	EGG-1842	18" x 42"	73 lbs.
ECC-1848	EGG-1848	18" x 48"	81 lbs.
ECC-1854	EGG-1854	18" x 54"	88 lbs.
ECC-1860	EGG-1860	18" x 60"	99 lbs.
ECC-1872	EGG-1872	18" x 72"	115 lbs.
ECC-2436	EGG-2436	24" x 36"	75 lbs.
ECC-2442	EGG-2442	24" x 42"	81 lbs.
ECC-2448	EGG-2448	24" x 48"	89 lbs.
ECC-2454	EGG-2454	24" X 54"	97 lbs.
ECC-2460	EGG-2460	24" x 60"	111 lbs.
ECC-2472	EGG-2472	24" x 72"	127 lbs.



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Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 2 Quantity: 2
Manufacturer: ADVANCE TABCO
Model: ECC-1848-X
Description: WIRE SHELVING UNIT

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

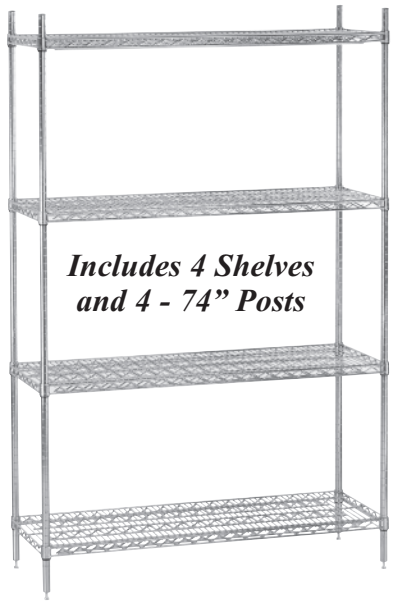
CHROME or GREEN EPOXY COATED

WIRE SHELVING COMBO

Item #: _____ Qty #: _____

Model #: _____

Project #: _____





FEATURES:

Each shelf holds up to 800 lbs. evenly distributed weight.
NSF approved.
Posts are numbered for easy assembly and are included.

CONSTRUCTION:

Unit assembles using tapered split sleeves.

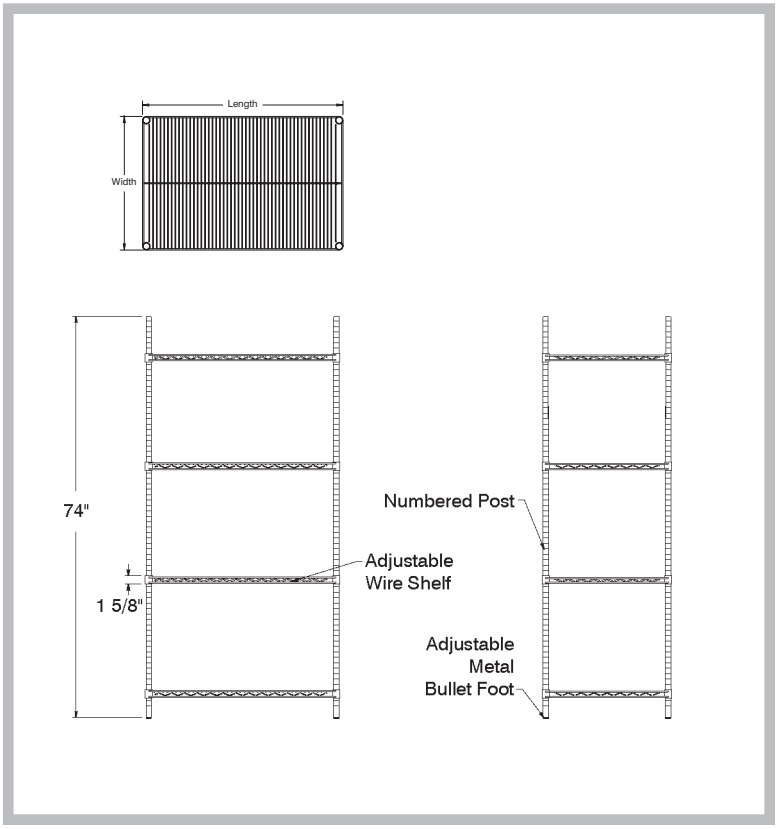
MATERIAL:

Chrome plated or green epoxy coating.

DIMENSIONS and SPECIFICATIONS

TOL ± .500" ALL DIMENSIONS ARE TYPICAL

CHROME MODEL #	GREEN EPOXY COATED MODEL #	Shelf Size	Weight
ECC-1436	EGG-1436	14" x 36"	64 lbs.
ECC-1442	EGG-1442	14" x 42"	69 lbs.
ECC-1448	EGG-1448	14" x 48"	75 lbs.
ECC-1460	EGG-1460	14" x 60"	93 lbs.
ECC-1472	EGG-1472	14" x 72"	107 lbs.
ECC-1836	EGG-1836	18" x 36"	68 lbs.
ECC-1842	EGG-1842	18" x 42"	73 lbs.
ECC-1848	EGG-1848	18" x 48"	81 lbs.
ECC-1854	EGG-1854	18" x 54"	88 lbs.
ECC-1860	EGG-1860	18" x 60"	99 lbs.
ECC-1872	EGG-1872	18" x 72"	115 lbs.
ECC-2436	EGG-2436	24" x 36"	75 lbs.
ECC-2442	EGG-2442	24" x 42"	81 lbs.
ECC-2448	EGG-2448	24" x 48"	89 lbs.
ECC-2454	EGG-2454	24" X 54"	97 lbs.
ECC-2460	EGG-2460	24" x 60"	111 lbs.
ECC-2472	EGG-2472	24" x 72"	127 lbs.



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 3 Quantity: 3
Manufacturer: ADVANCE TABCO
Model: EGG-1860-X / EGG-1854-X
Description: WIRE SHELVING UNIT

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½"	☐ ¾"	☐
Hot Water	½"	☐ 3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐ 1"	☐
Return:	½"	☐ 1"	☐

Description / Accessories:

Reviewer's Stamp:

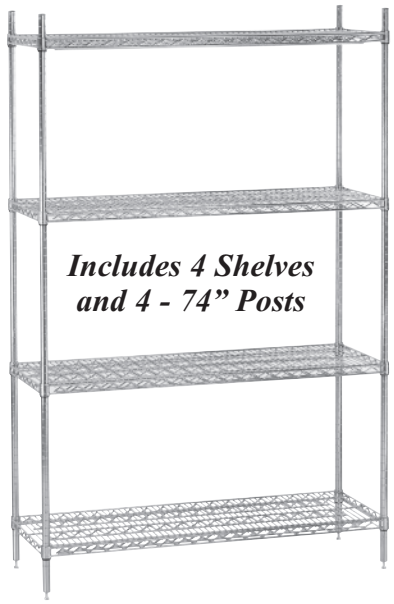
CHROME or GREEN EPOXY COATED

WIRE SHELVING COMBO

Item #: _____ Qty #: _____

Model #: _____

Project #: _____





FEATURES:

Each shelf holds up to 800 lbs. evenly distributed weight.
NSF approved.
Posts are numbered for easy assembly and are included.

CONSTRUCTION:

Unit assembles using tapered split sleeves.

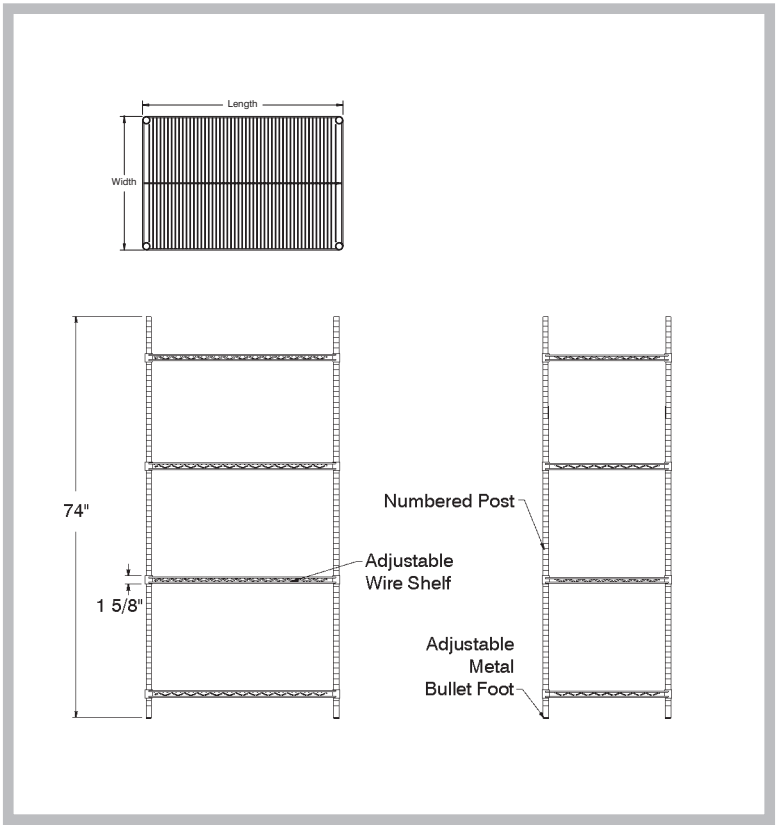
MATERIAL:

Chrome plated or green epoxy coating.

DIMENSIONS and SPECIFICATIONS

TOL ± .500" ALL DIMENSIONS ARE TYPICAL

CHROME MODEL #	GREEN EPOXY COATED MODEL #	Shelf Size	Weight
ECC-1436	EGG-1436	14" x 36"	64 lbs.
ECC-1442	EGG-1442	14" x 42"	69 lbs.
ECC-1448	EGG-1448	14" x 48"	75 lbs.
ECC-1460	EGG-1460	14" x 60"	93 lbs.
ECC-1472	EGG-1472	14" x 72"	107 lbs.
ECC-1836	EGG-1836	18" x 36"	68 lbs.
ECC-1842	EGG-1842	18" x 42"	73 lbs.
ECC-1848	EGG-1848	18" x 48"	81 lbs.
ECC-1854	EGG-1854	18" x 54"	88 lbs.
ECC-1860	EGG-1860	18" x 60"	99 lbs.
ECC-1872	EGG-1872	18" x 72"	115 lbs.
ECC-2436	EGG-2436	24" x 36"	75 lbs.
ECC-2442	EGG-2442	24" x 42"	81 lbs.
ECC-2448	EGG-2448	24" x 48"	89 lbs.
ECC-2454	EGG-2454	24" X 54"	97 lbs.
ECC-2460	EGG-2460	24" x 60"	111 lbs.
ECC-2472	EGG-2472	24" x 72"	127 lbs.



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 4 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: EGG-1472 / EGG-1436
Description: WIRE SHELVING UNIT

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

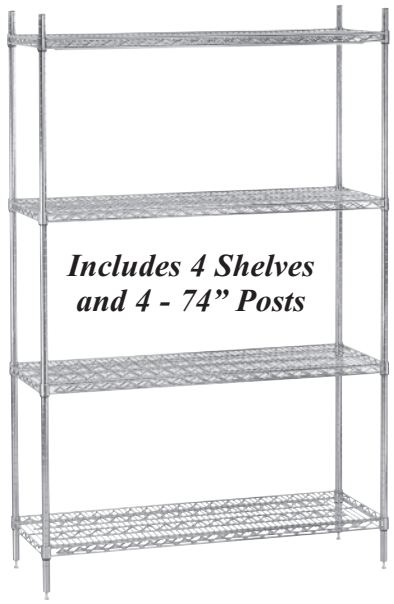
CHROME or GREEN EPOXY COATED

WIRE SHELVING COMBO

Item #: _____ Qty #: _____

Model #: _____

Project #: _____





FEATURES:

Each shelf holds up to 800 lbs. evenly distributed weight.
NSF approved.
Posts are numbered for easy assembly and are included.

CONSTRUCTION:

Unit assembles using tapered split sleeves.

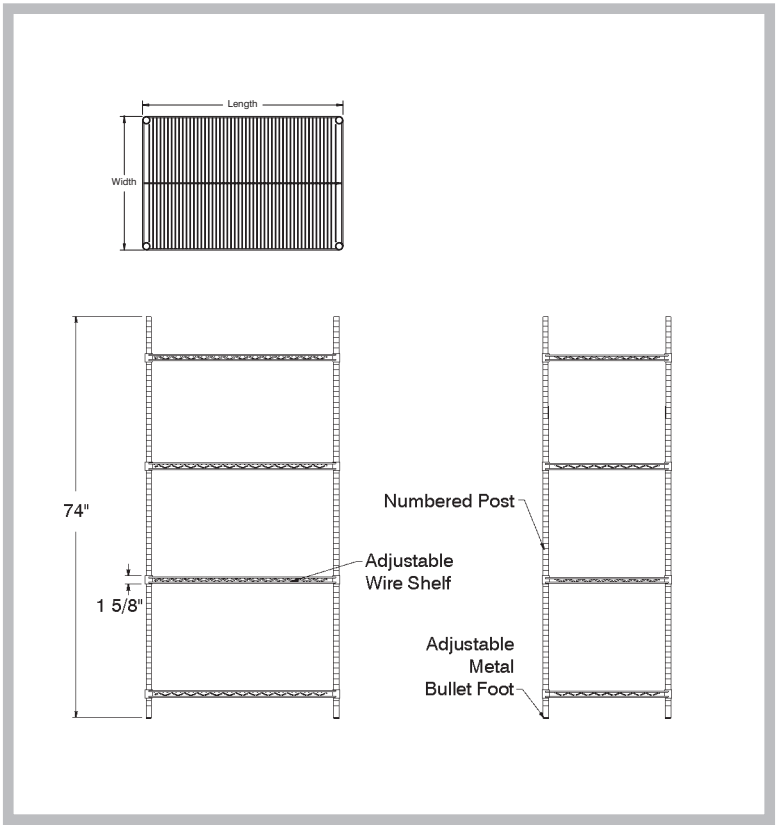
MATERIAL:

Chrome plated or green epoxy coating.

DIMENSIONS and SPECIFICATIONS

TOL ± .500" ALL DIMENSIONS ARE TYPICAL

CHROME MODEL #	GREEN EPOXY COATED MODEL #	Shelf Size	Weight
ECC-1436	EGG-1436	14" x 36"	64 lbs.
ECC-1442	EGG-1442	14" x 42"	69 lbs.
ECC-1448	EGG-1448	14" x 48"	75 lbs.
ECC-1460	EGG-1460	14" x 60"	93 lbs.
ECC-1472	EGG-1472	14" x 72"	107 lbs.
ECC-1836	EGG-1836	18" x 36"	68 lbs.
ECC-1842	EGG-1842	18" x 42"	73 lbs.
ECC-1848	EGG-1848	18" x 48"	81 lbs.
ECC-1854	EGG-1854	18" x 54"	88 lbs.
ECC-1860	EGG-1860	18" x 60"	99 lbs.
ECC-1872	EGG-1872	18" x 72"	115 lbs.
ECC-2436	EGG-2436	24" x 36"	75 lbs.
ECC-2442	EGG-2442	24" x 42"	81 lbs.
ECC-2448	EGG-2448	24" x 48"	89 lbs.
ECC-2454	EGG-2454	24" X 54"	97 lbs.
ECC-2460	EGG-2460	24" x 60"	111 lbs.
ECC-2472	EGG-2472	24" x 72"	127 lbs.



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 5 Quantity: 2
Manufacturer: RUBBERMAID
Model: FG395900GRAY
Description: TRASH RECEPTACLE

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

Rubbermaid®
Commercial Products

Untouchable®

CONTAINERS AND LIDS



Smarter Design

New Untouchable® Containers and Lids provide hands-free, hygienic disposal of waste and recyclables. Patent-pending can liner cinch makes waste collection more efficient.



INTEGRATED LINER CINCH
Patent-pending liner cinch allows easy one-step can liner retention and eliminates knot tying.



3569-07
23 Gal Square
Recycling Container



2691
Bottle/Can
Recycling Top



2690
Paper Recycling Top



256S
Recycling Label Kit

Optional Recycling Label Kit includes one set of 11 color-coded symbol labels and three sets of 11 word labels in English, Spanish, and French.



3569-88
23 Gal Square Container
Gray



3569-88
23 Gal Square Containers
Black, Brown, Beige



2689-88
Swing Lid
Black



2689-88
Swing Lid
Beige

No.	Description	Dimensions	Capacity	Ship Wt/Ctn	Color	Pack
3569-07	Untouchable® Square Container - Recycling	16.5" l x 15.5" w x 30.9" h	23 gal	21.2 lb	BLUE	4
3569-88	Untouchable® Square Container	16.5" l x 15.5" w x 30.9" h	23 gal	21.2 lb	BEIG, BRN, GRAY, BLA	4
256S	Recycling Label Kit	N/A		N/A	0000	8
2689-88	Swing Lid fit 3569 Containers	16" l x 16" w x 4" h		12.6 lb	BEIG, BLA	4
2690	Paper Recycle Top	16" l x 16" w x 3.2" h		4.7 lb	BLUE	4
2691	Bottle/Can Recycle Top	16" l x 16" w x 3.2" h		4.7 lb	BLUE	4

A Newell Rubbermaid Company

©2008 by Rubbermaid Commercial Products LLC

3124 Valley Avenue, Winchester, VA 22601

12/07 MP 50M SM717

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Rubbermaid® Commercial Products

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 6-9 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 10 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: AG-3610
Description: WORKTABLE

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Work Table, 120"W x 36"D, 16 gauge 430 stainless steel top, 18 gauge galvanized adjustable undershelf, galvanized legs with adjustable plastic bullet feet, NSF
4 ea Model TA-38 Drawer Assembly, (3) tier, 20"W x 20"D x 5" deep removable stainless steel drawer inserts, roller bearing drawer slides, self closing drawers with noise control, concealed side panels, 430 stainless steel, all TIG welded & fully assembled, (4) stainless steel legs with 1/2" adjustable hex feet (factory installation only)
1 ea Mid mount
1 ea Model TA-228-3 Mid mounting provision for 96" or longer
1 ea Model SCT-120 Pot Rack, table mounted, circular design, 120"W, stainless steel, includes:
(18) plated pot hooks & (1) AUR-120 utensil rack
4 pk Model TA-89 Pot Hooks, plated, double sided (package of 4)

Reviewer's Stamp:

STAINLESS STEEL

WORK TABLES

SUPER SAVER Series - Flat Top - UNDERSHELF Style



Item #: _____ Qty #: _____

Model #: _____

Project #: _____



Rolled Rim Edges on Front & Back and Square Side Edges



Featuring as Standard:
"THE PROVEN"
ORIGINAL ADVANCE TABCO
Adjustable Undershelf with Die Cast Leg Clamp

FEATURES:

Top is furnished with 1-5/8" sanitary rolled rim edges on front & back and square side edges.

To reinforce and maintain a level working surface, 24" wide tables are supplied with TWO hat channels and 30" and 36" wide tables are supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future drawer installation.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts & bolts. Undershelf is adjustable.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs..

Gussets welded to support hat sections.

MATERIAL:

SAG-SERIES: Stainless Steel Legs & Undershelf

TOP: 16 gauge stainless steel type "430" series.
SHELF: 18 gauge stainless steel.
LEGS: 1 5/8" diameter tubular stainless steel.
1" adjustable **stainless steel** bullet feet.
Stainless steel gussets.

AG-SERIES: Galvanized Legs & Undershelf

TOP: 16 gauge stainless steel type "430" series.
SHELF: 18 gauge galvanized steel.
LEGS: 1 5/8" diameter tubular galvanized steel.
1" adjustable plastic bullet feet.
Galvanized steel gussets.

SAG-Series:
Stainless Steel Legs & Undershelf

L	24" Wide	30" Wide	36" Wide
30"	SAG-240	SAG-300	
24"	SAG-242	SAG-302	SAG-362
36"	SAG-243	SAG-303	SAG-363
48"	SAG-244	SAG-304	SAG-364
60"	SAG-245	SAG-305	SAG-365
72"	SAG-246	SAG-306	SAG-366
84"	SAG-247	SAG-307	SAG-367
96"	SAG-248	SAG-308	SAG-368
108"	SAG-249	SAG-309	SAG-369
120"	SAG-2410	SAG-3010	SAG-3610
132"	SAG-2411	SAG-3011	SAG-3611
144"	SAG-2412	SAG-3012	SAG-3612

NSF

AG-Series:
Galvanized Steel Legs & Undershelf

L	24" Wide	30" Wide	36" Wide
30"	AG-240	AG-300	
24"	AG-242	AG-302	AG-362
36"	AG-243	AG-303	AG-363
48"	AG-244	AG-304	AG-364
60"	AG-245	AG-305	AG-365
72"	AG-246	AG-306	AG-366
84"	AG-247	AG-307	AG-367
96"	AG-248	AG-308	AG-368
108"	AG-249	AG-309	AG-369
120"	AG-2410	AG-3010	AG-3610
132"	AG-2411	AG-3011	AG-3611
144"	AG-2412	AG-3012	AG-3612

Create Your Own Efficient Workstation with the Available Standard Accessories (Visit Section K)

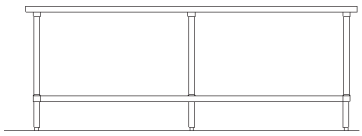
DIMENSIONS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL TOL ± .500”

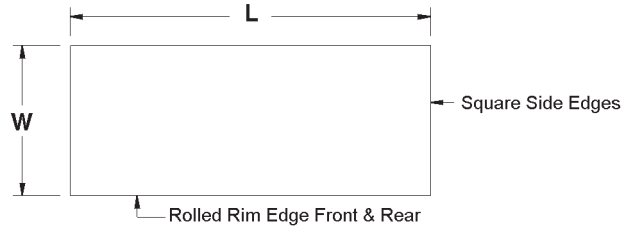
All Units Shipped Unassembled (KD) for Reduced Shipping Costs.

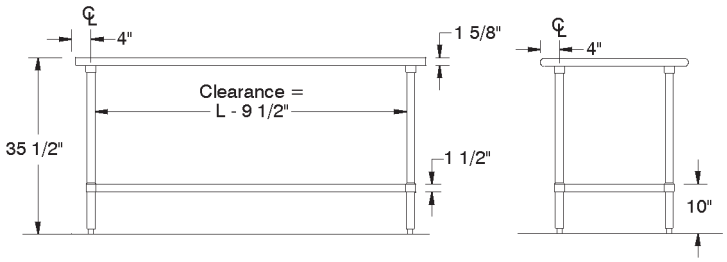
SAG & AG Series
UNDERSHELF Style
FLAT TOP

Finished size of undershelf = Length minus 5 3/4”
Width minus 5 3/4”



Units 8 ft. and larger are furnished with six (6) legs





SAG-Series: Stainless Steel Legs & Undershelf

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	SAG-240	49 lbs.	SAG-300	65 lbs.		
24”	SAG-242	31 lbs.	SAG-302	55 lbs.	SAG-362	81 lbs.
36”	SAG-243	64 lbs.	SAG-303	72 lbs.	SAG-363	88 lbs.
48”	SAG-244	79 lbs.	SAG-304	89 lbs.	SAG-364	98 lbs.
60”	SAG-245	92 lbs.	SAG-305	107 lbs.	SAG-365	118 lbs.
72”	SAG-246	109 lbs.	SAG-306	125 lbs.	SAG-366	138 lbs.
84”	SAG-247	130 lbs.	SAG-307	148 lbs.	SAG-367	164 lbs.
96”	SAG-248	145 lbs.	SAG-308	166 lbs.	SAG-368	184 lbs.
108”	SAG-249	161 lbs.	SAG-309	176 lbs.	SAG-369	190 lbs.
120”	SAG-2410	261 lbs.	SAG-3010	287 lbs.	SAG-3610	308 lbs.
132”	SAG-2411	293 lbs.	SAG-3011	324 lbs.	SAG-3611	358 lbs.
144”	SAG-2412	308 lbs.	SAG-3012	339 lbs.	SAG-3612	373 lbs.

AG-Series: Galvanized Steel Legs & Undershelf

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	AG-240	49 lbs.	AG-300	65 lbs.		
24”	AG-242	31 lbs.	AG-302	55 lbs.	AG-362	81 lbs.
36”	AG-243	64 lbs.	AG-303	72 lbs.	AG-363	88 lbs.
48”	AG-244	79 lbs.	AG-304	89 lbs.	AG-364	98 lbs.
60”	AG-245	92 lbs.	AG-305	107 lbs.	AG-365	118 lbs.
72”	AG-246	109 lbs.	AG-306	125 lbs.	AG-366	138 lbs.
84”	AG-247	130 lbs.	AG-307	148 lbs.	AG-367	164 lbs.
96”	AG-248	145 lbs.	AG-308	166 lbs.	AG-368	184 lbs.
108”	AG-249	161 lbs.	AG-309	176 lbs.	AG-369	190 lbs.
120”	AG-2410	261 lbs.	AG-3010	287 lbs.	AG-3610	308 lbs.
132”	AG-2411	293 lbs.	AG-3011	324 lbs.	AG-3611	358 lbs.
144”	AG-2412	308 lbs.	AG-3012	339 lbs.	AG-3612	373 lbs.

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325 Wireless Boulevard, Hauppauge, NY 11788

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STAINLESS STEEL

ADD-A-TIER DRAWERS

Fits Under 24", 30" and 36" Wide Open Base Work Tables!

FEATURES:

Units come Fully Assembled!

Stainless Steel Drawers feature **SHD Series Drawers** with Integral drawer slides & removable stainless steel drawer inserts.

Includes 2 or 3 drawers with 2 Concealed Side Panels (See Photos).

Drawer "Safety Stop" tab.

Mounts from underside of Open Base Table with Included Hardware.

CONSTRUCTION:

All TIG welded.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer inset.

Self closing drawer with noise control.

MATERIAL:

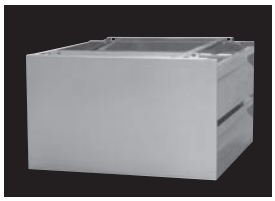
Heavy gauge type 430 series stainless steel.



ADT-3-2020 SERIES SHOWN
(Table not included)

Model #	Description	Weight
ADT-2-2020	2 Tier Drawers	87 lbs.
ADT-3-2020	3 Tier Drawers	105 lbs.
ADT-3-2015	3 Tier Drawers	85 lbs.

INCLUDES 2 CONCEALED SIDE PANELS



2 Drawer Concealed Panel
Model ADT-2-2020 Shown



3 Drawer Concealed Panel
Model ADT-3-2020 Shown



Rear View of Stacked Drawers
Drawer Seams Exposed

STAINLESS STEEL

FACTORY INSTALLED "SHD SERIES" TIER DRAWERS

(FACTORY INSTALLATION ONLY)

FEATURES:

3-Tier Drawers factory installed.

1 5/8" diameter tubular stainless steel legs & gussets.

Stainless Steel Drawers feature **SHD Series Drawers** with Integral Drawer Slides & removable stainless steel drawer inserts.

Drawer "Safety Stop" tab.

CONSTRUCTION:

All TIG welded.

Legs bolt on to table base.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer insert.

Self closing drawer with noise control.

MATERIAL:

Heavy gauge type 430 series stainless steel.

LEGS are stainless steel and include 1 1/2" adjustable hex foot.

New 4 Tier Unit Offers
33% Greater Storage, within the
Same Overall Dimension!



TA-38 SHOWN

Model #	Description	Weight
TA-38	3-Tier Drawers	130 lbs.
TA-384	4-Tier Drawers	165 lbs.

FEATURING BOLT-ON
STAINLESS STEEL LEG

For Tier Drawers on 24" Wide Enclosed Base Tables, Add **TA-380** (Drawers will be 20" x 15" x 5")

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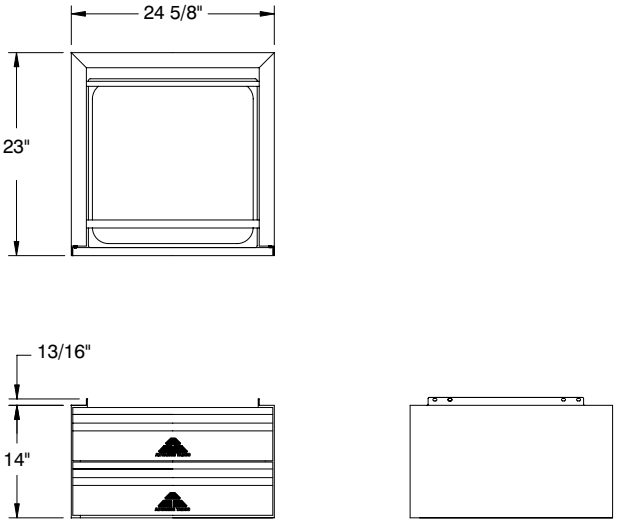
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DETAILS and SPECIFICATIONS

TOL ± .500”

ALL DIMENSIONS ARE TYPICAL

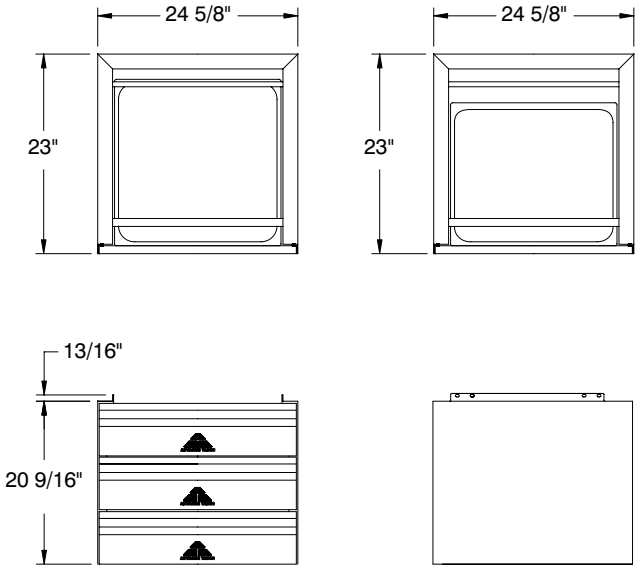
ADT-2-2020



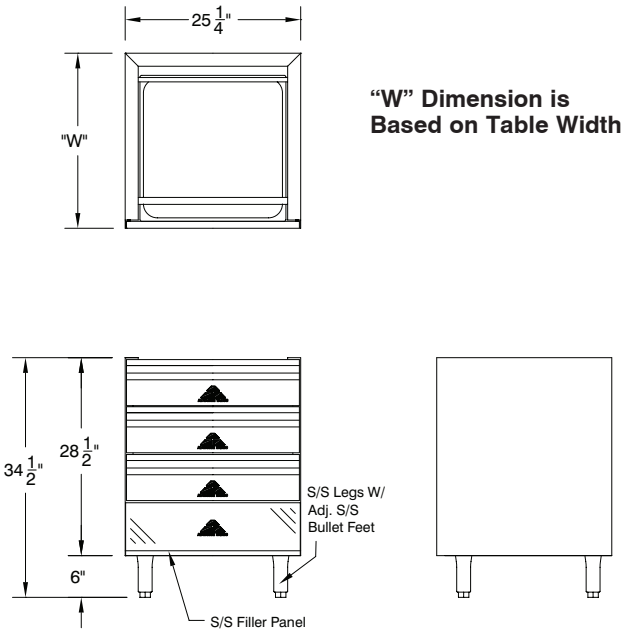
ADT-3-2015
ADT-3-2020

TOP VIEW OF ADT-3-2020

TOP VIEW OF ADT-3-2015

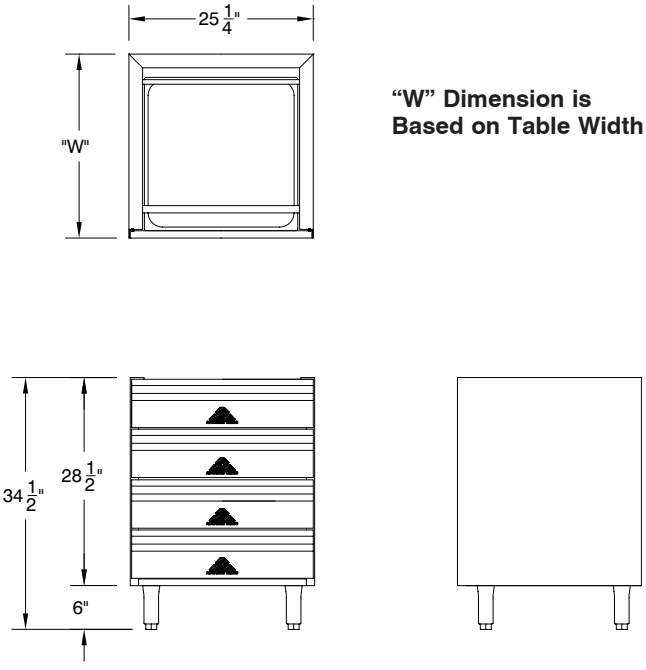


TA-38 THREE TIER UNIT



“W” Dimension is Based on Table Width

TA-384 FOUR TIER UNIT



“W” Dimension is Based on Table Width

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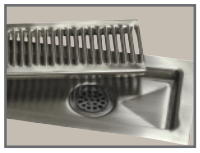
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TABLE MODIFICATIONS & ACCESSORIES

TOP MODIFICATIONS



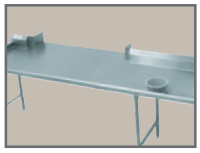
TA-56
5" NSF Partition



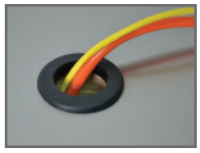
TA-523
Drop-In Urn Trough



CDR-5
Condiment Holder



TA-84
Pass-Thru



TA-108
Grommet For Cords

QTY.		
____	CDR-5	Condiment Holder (Accommodates 5 Bins)
____	TA-1	Notch Backsplash For Roll Up Door w/ Pass-Thru
____	TA-3	Stainless Steel Hat Channel & Gusset Upgrade
____	TA-7	10" Partial Splash
____	TA-8	Column Notch in Rear Splash (Includes Splash)
____	TA-10	5" Partial Splash
____	TA-12	Countertop Edge
____	TA-22	Square Edge Table
____	TA-28	Cut-Out For Cold Well. Incudes Louvered Doors
____	TA-29	16 Ga. 304 Rear Splash Capping Strip w/Adhesive Backing
____	TA-30	1-1/2" Side Splash
____	TA-30A	1-1/2" Turn Up For Table Tops
____	TA-31	5" Side Splash
____	TA-32	10" Side Splash
____	TA-34	Top Cut-Out
____	TA-34A	Top Cut-Out for Undermount Well
____	TA-35	Splash Cut-Out
____	TA-41	Poly-Vance 5/8" Cutting Board
____	TA-56	5" NSF Partition
____	TA-56A	18" NSF Partition
____	TA-57	Prepare Welded Field Joint (Welded in field by others)
____	TA-57A	Bolted Field Joint (Bolted in field by others)
____	TA-57B	Hairline Field Joint
____	TA-58	Stepdown to 24" Working Height
____	TA-64	Urn Trough (Factory installation only)
____	TA-75	Mitered Edge
____	TA-76	Paint on Sound Deadening
____	TA-79	Flour Trough (Factory installation only)
____	TA-82	Scrap Chute (6" dia. opening)
____	TA-84	Simple Pass-Thru
____	TA-87	Enclosed Rear Splash
____	TA-91	Poly Retaining Clips Includes TA-22 (S/S top table)

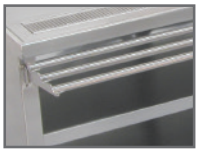
QTY.		
____	TA-93	Wall Brackets (Includes 2. For 5" & 10 1/2" splash only)
____	TA-96A	Can Opener Provision for Openers with Bolt-on Base (Customer to provide location)
____	TA-96B	Can Opener Surface Mount Provision with 4" S/S Tube for Openers w/o Base (Customer to provide location)
____	TA-96C	Can Opener Spacer Plate Provision for Use on Tables With Countertop Edge & Can Opener Base (Customer to provide location)
____	TA-100	Bull Nose All Sides of Worktable
____	TA-101	Rear Tray Lock
____	TA-106	Mirror HI-LITE Edge
____	TA-107	Vacuum Breaker Holes on Tables (Includes Backsplash with 2" Return)
____	TA-108	2" Hole with Grommet for Appliance Cord
____	TA-112	Hubble Outlet
____	TA-113	Notch Top for Buyout Unit
____	TA-130	Cutlery Dispenser Holder (Undercounter Mounted)
____	TA-135	Plate Shelf (Undercounter Mounted)
____	TA-366A	Heavy duty Understructure Top
____	TA-502	Install Advnace Tabco Hot Food Unit In Work Table Top (Requires TA-34 Top Cut-Out & TA-27 Control Panel. Does not include wiring. Consult factory)
____	TA-521	Drop-In urn Trough 1'
____	TA-522	Drop-In urn Trough 2'
____	TA-523	Drop-In urn Trough 3'
____	TA-524	Drop-In urn Trough 4'
____	TA-525	Drop-In urn Trough 5'
____	TA-526	Drop-In urn Trough 6'
____	TA-527	Drop-In urn Trough 7'
____	TA-528	Drop-In urn Trough 8'
____	TA-529	Drop-In urn Trough 9'
____	TA-550	Install Customer Supplied Buyout Items (Does not include wiring. Consult factory)
____	TA-551	Installation of Hot Food Wells. (Requires TA-34 Top Cut-Out & TA-27 Control Panel. Does not include wiring. Consult factory)

TABLE MODIFICATIONS & ACCESSORIES

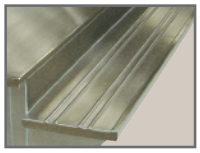
BASE MODIFICATIONS



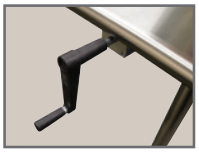
TA-39
Louvered Hinged Doors



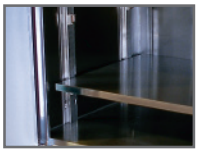
TA-73
Drop-Down Tray Slide



TA-74
Solid Tray Slide



TA-900
ADJ. Height Tables



TA-116
Adj. Mid-Shelf

QTY.		
____	TA-4	Removable Access Panel
____	TA-4A	Luvered Panel
____	TA-5	Curb Mounting Provision
____	TA-15	Provision for Built In Drawer Warmer
____	TA-23	Welded Set-Up Table/Crating
____	TA-24	Shell Crating
____	TA-27	Control Panel (Must add TA-34A or TA-34B)
____	TA-36A	Sliding/Hinge Stainless Steel Doors
____	TA-36B	1/2 Height Stainless Steel Hinge Doors
____	TA-36C	Hinged door with Trash Flap
____	TA-37	Stainless Enclosed Base
____	TA-39	24" Louvered Hinged Doors
____	TA-40	Remove Undershelf in Cabinet Base For Slide in Buyout
____	TA-42	Interior Partition (2.5"x30")
____	TA-43	Filler Panel (3"x30" with Flanged Feet)
____	TA-44	K.D. Aluminum Pan Rack Slides (6 slides. Table min. lgth. 30")
____	TA-45	K.D. Aluminum Glass Rack Slides (3 slides. Table min. lgth. 3 feet)
____	TA-46	Door Locks

QTY.		
____	TA-48	12"x12" Cut-Out in Back Panel/Undershelf for Plumbing
____	TA-54	Removable Kick Plate
____	TA-55	Remove Back Panel (on Enclosed Base)
____	TA-63	Removable Shelving (In addition to standard shelf & table width)
____	TA-70	S/S Tubular Tray Divider (12" sections)
____	TA-73	Tubular Tray Slide w/Dropdown (Stationary Tray Slide Available. Factory installation only)
____	TA-74	Solid Tray Slide
____	TA-92	12" Apron (in front of sink)
____	TA-92A	17" Stainless Steel Apron to Cover Sink Bowls and Support Lever Drain Handles
____	TA-116	Adjustable Enclosed Base Cabinet Mid Shelf- Add to Price of Enclosed Base Table with Fixed Mid Shelf **(M)**. Shelves Over 36" In Length Require Multiple Sections With Center Partition. For Partial Shelves Add To Price Of Shelf.
____	TA-130	Cutlery Dispenser Holder (Undercounter Mounted)
____	TA-135	Plate Shelf (Undercounter Mounted)
____	TA-205	Connect Cafeteria Items (Per Joint Between 2 Tables. Requires Casters)
____	TA-900	Upgrade Table To be Height Adjustable In Field (Up to 6" Only. Unit Ships Set Up)

ELECTRICAL & DATA PORT OUTLETS



TA-62
Duplex Outlet



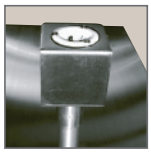
TA-62A
GFI Duplex Outlet



TA-62D
GFI Doghouse Outlet



TA-62F
Empty Junction Box



TA-112
Hubble Outlet

QTY.		
____	TA-62	Standard Duplex Electrical Outlet & Cover Plate (Under Flat Top). NEMA 5-15R
____	TA-62A	GFI Duplex Outlet & Cover Plate in a VKS Splash. NEMA 5-20R
____	TA-62C	GFI Duplex Outlet & Cover Plate Below Shelf Top. NEMA 5-20R
____	TA-62D	GFI Duplex Outlet & Cover Plate in a Doghouse. NEMA 5-20R

QTY.		
____	TA-62E	Upgrade Outlet to a NEMA 6-20R or Equiv.
____	TA-62F	Junction Box (empty) Below Table Top. Includes 1 Gang Size, Stainless Steel Face Plate
____	TA-112	Hubble Outlet
____	TA-622	CAT-5 Data Port Outlet. Cable Not Included

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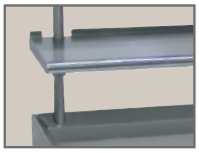
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TABLE MODIFICATIONS & ACCESSORIES

OVERSHELF & POT RACK MODIFICATIONS



TA-9A
1" Turn Up



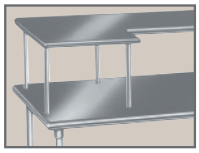
TA-22A
Square Edge



TA-71
Heat Lamp Mounting Provision



TA-100A
Bull Nose



TA-102
24" x 24" Extension

QTY.		
____	TA-9A	Partial 1" Turn-Up for all Table Mt. Shelves
____	TA-22A	Square Edge on Overshelf
____	TA-26-10	Welded Wall Shelf Brackets for 10" Wide Shelf
____	TA-26-12	Welded Wall Shelf Brackets for 12" Wide Shelf
____	TA-26-15	Welded Wall Shelf Brackets for 15" Wide Shelf
____	TA-26-18	Welded Wall Shelf Brackets for 18" Wide Shelf
____	TA-47	Shelf Mounting Bracket for Existing Table
____	TA-49	Wall Shelf 2" Offset
____	TA-60	Special Sizing Charge for Shelves (Must Order Larger Unit to be Cut Down to Smaller Size)
____	TA-71	Heat Lamp Mounting Provision
____	TA-71A	Heat Lamp Remote Control Bracket
____	TA-78	Additional Lin. Ft. Past 12' For Table Mt. Shelf (For ODS, OTS, TS, DS & WS Shelving only)
____	TA-77	Check Minder Shelf Provision (Factory install only)
____	TA-83	Spice Bins

QTY.		
____	TA-84A	Knife Rack for Rolled Rim Tables
____	TA-84B	Knife Rack for Poly Top Tables
____	TA-84C	Knife Rack for Square Edge Tables
____	TA-86	Stainless Steel Pot Hooks
____	TA-89	Double Sided Plated Pot Hooks (Package of 4)
____	TA-89A	Single Sided Plated Pot Hooks (Package of 4)
____	TA-98	Stainless Steel Flat Bar in lieu of Chain
____	TA-99	16 Ga. S/S 304 Upgrade for Wall & Over Shelves
____	TA-100A	Bull Nose All Sides of Shelf
____	TA-100R	Bull Nose Three Sides of Shelf w/ Rear Turn Up
____	TA-102	24" x 24" Extension for Microwave or Computer Shelf (Add to OTS and ODS Shelves. See page 65)
____	TA-103	24" Wide PT Shelf (36" Min Length. Mid mount only. PT Series Shelf, See Pg. 73. Add to 18" Wide Shelf)
____	TA-104	Additional Length Over 12' (Add to 18" Shelf. (PA & CU Shelving Only. Max. Length is 14' as Single Piece)

UNDERSHELF MODIFICATIONS

QTY.		
____	TA-9	1-1/2" Turn-Up for Undershelves
____	TA-17	Upgrade Undershelf to a Marine Edge (Must add TA-23)
____	TA-48	12"x12" Cut-Out in Back Panel or Undershelf for Plumbing

QTY.		
____	TA-94	Upgrade 16 Ga. 304 S/S Undershelf
____	TA-94A	Upgrade 14 Ga. 304 S/S Undershelf
____	TA-366	Reinforced Understructure For Undershelves

SIZE MODIFICATIONS

QTY.		
____	TA-33	Special Working Height
____	TA-59	36" Wide Equipment Stand
____	TA-6	Extra Length for Standard Tables Over 12' (Tables Over 14' Require Field Joint TA-57)
____	TA-61	Special Sizing Charge (Larger Unit Cut Down to Smaller Size)
____	TA-61A	Special Modification Charge

QTY.		
____	TA-65	Enclosed Base Units Over 12' (Open Base Table)
____	TA-66	Enclosed Base Units Over 12' (Sliding Door Units)
____	TA-67	Enclosed Base Units Over 12' (Hinged Door Units)
____	TA-105	Modify Enclosed Base Table w/ Drawers to 24" Width
____	TA-110	Modify Enclosed Base Table w/ Drawers to 36" Width

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TABLE MODIFICATIONS & ACCESSORIES

LEG MODIFICATIONS

QTY.		
____	TA-16	1 Galvanized Leg with Plastic Bullet Foot (34 1/2" Total Length)
____	TA-16-4	4 Galvanized Legs with Plastic Bullet Feet (34 1/2" Total Length)
____	TA-16-6	6 Galvanized Legs with Plastic Bullet Feet (34 1/2" Total Length)
____	TA-19	Stainless Steel Flanged Bullet Foot For Work Table
____	TA-19L	S/S Bolt-on Leg w/ Flanged Foot For Enclosed Base Table
____	TA-20	1 Stainless Steel Leg with S/S Bullet Foot (34 1/2" Total Length)
____	TA-20-4	4 Stainless Steel Leg with S/S Bullet Feet (34 1/2" Total Length)

QTY.		
____	TA-20-6	6 Stainless Steel Leg with S/S Bullet Feet (34 1/2" Total Length)
____	TA-20L	Replacement Bolt-on Leg For Enclosed Base Table
____	TA-21	Stainless Steel Bullet Foot
____	TA-68	Relocate Rear Cross Rail To Center (for Open Base Tables Only)
____	TA-72	Leg to Wall Brace (Set per table)
____	TA-95	Upgrade 16 Ga. 304 S/S Legs Only

WORK TABLE CASTERS



Standard Casters

Maintains the Standard 35-1/2" Working Height

200 lbs. Load Capacity Per Caster

When Used w/ Stainless Steel Legs

TA-25S-4 **Set of 4** (Two with Brakes)
TA-25S-6 **Set of 6** (Two with Brakes)

When Used w/ Galvanized Legs

TA-25G-4 **Set of 4** (Two with Brakes)
TA-25G-6 **Set of 6** (Two with Brakes)

Replacement Casters

For Work Tables

TA-25 **Set of 4** (Two with Brakes)

TA-25A **Set of 6** (Two with Brakes)

200 lbs. Load Capacity Per Caster



Optional Standard Caster Upgrades:

TA-25B Set For brakes on all wheels (Standard Casters) - Add price to the following models: TA-25, TA-25A, TA-25S-4, TA-25S-6, TA-25G-4, TA-25G-6

TA-25C Per Caster Upgrade Standard Caster with Heavy Duty Urethane Wheels (Per Caster)

EQUIPMENT STAND CASTERS



Standard Casters

5" Urethane Wheels.
Maintains the Standard 24" Working Height

200 lbs. Load Capacity Per Caster

w/ Stainless Steel Legs
TA-25ES **Set of 4** (Two with Brakes)

w/ Galvanized Legs
TA-25EG **Set of 4** (Two with Brakes)



HEAVY DUTY Casters

5" Urethane Wheels

400 lbs. Load Capacity Per Caster

TA-255 Super Heavy Duty Set of 4 (Two with Brakes)

TA-256 Super Heavy Duty Set of 6 (Two with Brakes)

Enclosed Base Table Casters

Easy Bolt-On Style



TA-255P **Set of 4** (Two with Brakes)
TA-255AP **Set of 6** (Two with Brakes)

300 lbs. Load Capacity Per Caster

For brakes on all wheels (Enclosed Base Casters) - Add price to models: TA-255P or TA-255AP

TA-255PB

Optional Equipment Stand Caster Upgrade:

TA-255B For brakes on all wheels (Equipment Casters) - Add price to any of the following models: TA-255, TA-256, TA-25ES, TA-25EG

Contact Our SMART FABRICATION™ Department for more information at 800-645-3166 or email in your specifications to smartfab@advancetabco.com

325 Wireless Boulevard, Hauppauge, NY 11788

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, AUGUST 2019

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 11 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: TKMG-3010
Description: WORTKABLE

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	X	¾"	☐			
Hot Water	½"	X	3/4"	☐			

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ X Floor Sink X
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
Work Table, 120"W x 30"D, 16 gauge 304 stainless steel top with 5"H backsplash, galvanized legs with side & rear crossrails, adjustable plastic bullet feet, NSF
1 ea Model TA-56 5" tall NSF partition
1 ea Model UG-30-48 Work Table Undershelf, for work tables 48"W x 30"D, galvanized, NSF (actual shelf is 6" shorter than table width & depth) (suggested maximum load 300 pounds distributed weight)
1 ea Weld-In sink - single bowl
1 ea Model TA-11Q Sink Welded Into Table Top, 10"W x 14"D x 5" deep bowl, includes faucet, NSF (must specify sink location)
2 ea Model K-5 Drain, twist operated, 2" NPT & 1-1/2" IPS outlet connections
2 ea Model K-4 Support Bracket, for lever waste drain handle, (1) support required for each lever drain
1 ea Model TA-56 5" tall NSF partition
1 ea Weld-In sink - double bowl
1 ea Model TA-11J-2 Double Sink Welded Into Table Top, 14"W x 16"D x 12" deep bowls, includes faucet, NSF (must specify sink location)
2 ea Model K-5 Drain, twist operated, 2" NPT & 1-1/2" IPS outlet connections
2 ea Model K-4 Support Bracket, for lever waste drain handle, (1) support required for each lever drain
2 ea Model FC-455B Sink Cover, stainless steel, for 14" x 16" fabricated bowl (rests on edges of sink bowl such that the sink cover will be approximately flush with the tabletop or drainboard work surface)
1 ea Model ADT-3-2020 Drawer Assembly, (3) tier, 20"W x 20"D x 5" deep removable stainless steel drawer inserts, roller bearing drawer slides, self closing drawers with noise control, concealed side panels, 430 stainless steel, all TIG welded & fully assembled, NSF

Reviewer's Stamp:

STAINLESS STEEL

WORK TABLES

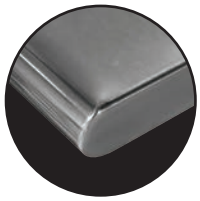
STANDARD Series - 5" Backsplash - Open Base Style



Item #: _____ Qty #: _____

Model #: _____

Project #: _____



Rolled Rim Edges on Front & Back and Square Side Edges



CROSS-BRACING Ensure Stability

FEATURES:

Top is furnished with 1 5/8" sanitary rolled rim edge on front and square sides, and a 5" splash with a 1" return on the rear side.

TWO hat channels stud welded to reinforce and maintain a level working surface. 30" and 36" wide tables supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future drawer installation.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat sections.

MATERIAL:

TKMS-SERIES: Stainless Steel Legs - Open Base

TOP: 16 gauge stainless steel type "304" series.

CROSS-BRACING: Rear: 1 5/8" dia. tubular stainless steel.
Sides: 1 1/4" dia. tubular stainless steel.

LEGS: 1 5/8" diameter tubular stainless steel.
1" adjustable stainless steel bullet feet.
Stainless steel gussets.

TKMG-SERIES: Galvanized Legs - Open Base

TOP: 16 gauge stainless steel type "304" series.

CROSS-BRACING: Rear: 1 5/8" dia. tubular galvanized steel.
Sides: 1 1/4" dia. tubular galvanized steel.

LEGS: 1 5/8" diameter tubular, galvanized steel.
1" adjustable plastic bullet feet.
Galvanized steel gussets.

TKMS-Series: Stainless Steel Legs & Cross-Br4acing

L	24" Wide	30" Wide	36" Wide
30"	TKMS-240	TKMS-300	
24"	TKMS-242	TKMS-302	TKMS-362
36"	TKMS-243	TKMS-303	TKMS-363
48"	TKMS-244	TKMS-304	TKMS-364
60"	TKMS-245	TKMS-305	TKMS-365
72"	TKMS-246	TKMS-306	TKMS-366
84"	TKMS-247	TKMS-307	TKMS-367
*96"	TKMS-248	TKMS-308	TKMS-368
*108"	TKMS-249	TKMS-309	TKMS-369
*120"	TKMS-2410	TKMS-3010	TKMS-3610
*132"	TKMS-2411	TKMS-3011	TKMS-3611
*144"	TKMS-2412	TKMS-3012	TKMS-3612

TKMG-Series: Galvanized Steel Legs & Cross-Bracing

L	24" Wide	30" Wide	36" Wide
30"	TKMG-240	TKMG-300	
24"	TKMG-242	TKMG-302	TKMG-362
36"	TKMG-243	TKMG-303	TKMG-363
48"	TKMG-244	TKMG-304	TKMG-364
60"	TKMG-245	TKMG-305	TKMG-365
72"	TKMG-246	TKMG-306	TKMG-366
84"	TKMG-247	TKMG-307	TKMG-367
*96"	TKMG-248	TKMG-308	TKMG-368
*108"	TKMG-249	TKMG-309	TKMG-369
*120"	TKMG-2410	TKMG-3010	TKMG-3610
*132"	TKMG-2411	TKMG-3011	TKMG-3611
*144"	TKMG-2412	TKMG-3012	TKMG-3612

*Units 8 ft. and larger are furnished with six (6) legs

Create Your Own Efficient Workstation with the Available Standard Accessories (Visit Section K)

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

www.advancetabco.com

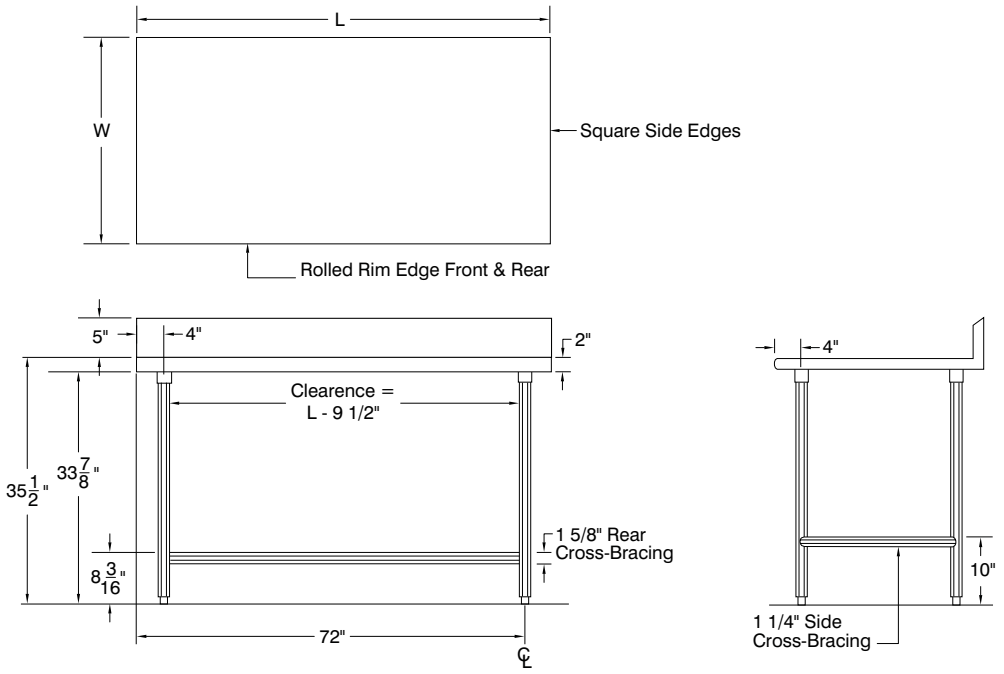
DETAILS and SPECIFICATIONS

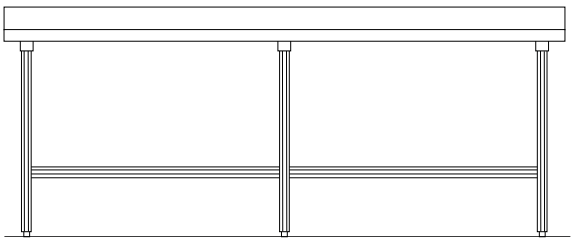
ALL DIMENSIONS ARE TYPICAL TOL ± .500”

All Units Shipped Unassembled (KD) for Reduced Shipping Costs.

STANDARD Series - 5” Backsplash - Open Base Style

TKMS & TKMG





Units 8 ft. and larger are furnished with six (6) legs

TKMS-Series: Stainless Steel Legs & Cross-Bracing

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	**TKMS-240**	49 lbs.	**TKMS-300**	55 lbs.		
24”	**TKMS-242**	43 lbs.	**TKMS-302**	48 lbs.	**TKMS-362**	75 lbs.
36”	**TKMS-243**	55 lbs.	**TKMS-303**	62 lbs.	**TKMS-363**	80 lbs.
48”	**TKMS-244**	67 lbs.	**TKMS-304**	75 lbs.	**TKMS-364**	85 lbs.
60”	**TKMS-245**	77 lbs.	**TKMS-305**	89 lbs.	**TKMS-365**	99 lbs.
72”	**TKMS-246**	89 lbs.	**TKMS-306**	97 lbs.	**TKMS-366**	112 lbs.
84”	**TKMS-247**	107 lbs.	**TKMS-307**	118 lbs.	**TKMS-367**	131 lbs.
96”	**TKMS-248**	119 lbs.	**TKMS-308**	131 lbs.	**TKMS-368**	145 lbs.
108”	**TKMS-249**	135 lbs.	**TKMS-309**	150 lbs.	**TKMS-369**	165 lbs.
120”	**TKMS-2410**	234 lbs.	**TKMS-3010**	249 lbs.	**TKMS-3610**	268 lbs.
132”	**TKMS-2411**	258 lbs.	**TKMS-3011**	276 lbs.	**TKMS-3611**	298 lbs.
144”	**TKMS-2412**	273 lbs.	**TKMS-3012**	291 lbs.	**TKMS-3612**	313 lbs.

TKMG-Series: Galvanized Steel Legs & Cross-Bracing

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	**TKMG-240**	49 lbs.	**TKMG-300**	55 lbs.		
24”	**TKMG-242**	43 lbs.	**TKMG-302**	48 lbs.	**TKMG-362**	75 lbs.
36”	**TKMG-243**	55 lbs.	**TKMG-303**	62 lbs.	**TKMG-363**	80 lbs.
48”	**TKMG-244**	67 lbs.	**TKMG-304**	75 lbs.	**TKMG-364**	85 lbs.
60”	**TKMG-245**	77 lbs.	**TKMG-305**	89 lbs.	**TKMG-365**	99 lbs.
72”	**TKMG-246**	89 lbs.	**TKMG-306**	97 lbs.	**TKMG-366**	112 lbs.
84”	**TKMG-247**	107 lbs.	**TKMG-307**	118 lbs.	**TKMG-367**	131 lbs.
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120”	**TKMG-2410**	234 lbs.	**TKMG-3010**	249 lbs.	**TKMG-3610**	268 lbs.
132”	**TKMG-2411**	258 lbs.	**TKMG-3011**	276 lbs.	**TKMG-3611**	298 lbs.
144”	**TKMG-2412**	273 lbs.	**TKMG-3012**	291 lbs.	**TKMG-3612**	313 lbs.

325 Wireless Boulevard, Hauppauge, NY 11788

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, JUNE 2024

Welded Sinks Into Table Top

Sink Bowls

Item #: _____ Qty #: _____

Model #: _____

Project #: _____



Flat Top w/ K-50 Deck Mount Faucet Shown



10" Backsplash w/ K-1 Splash Mount Faucet Shown

Includes Faucet & **K-6** 3-1/2" Basket Drain(s)

Size A	Size B	Single Bowl Model#	Double Bowl Model#
10"	14" x 5"	TA-11Q	TA-11Q-2†
10"	14" x 10"	TA-11F	TA-11F-2†
14"	16" x 12"	TA-11J	TA-11J-2
16"	20" x 8"	TA-11A**	TA-11A-2**
16"	20" x 12"	TA-11B**	TA-11B-2**
16"	20" x 14"	TA-11V**	TA-11V-2**
16"	24" x 14"	TA-11K**	TA-11K-2**
18"	18" x 14"	TA-11N	TA-11N-2
18"	24" x 14"	TA-11L	TA-11L-2
20"	20" x 8"	TA-11C*	TA-11C-2*
20"	20" x 12"	TA-11D*	TA-11D-2*
20"	20" x 14"	TA-11W*	TA-11W-2*
20"	24" x 14"	TA-11P*	TA-11P-2*
30"	20" x 14"	TA-11S*	TA-11S-2*
24"	24" x 14"	TA-11E*	TA-11E-2*
30"	24" x 14"	TA-11T*	TA-11T-2*
36"	24" x 14"	TA-11R*	TA-11R-2*
28"	20" x 14"	TA-11G*	TA-11G-2*

* Only Installed In Tables 30" Wide or Wider

** Bowls Are Turned In 24" Wide Tables

† K-50 Swing Spout Faucet (Double Bowl)

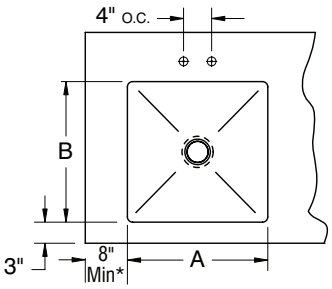
Flat Top, 1", 1-1/2" & 5 Backsplash Include Deck Mount Faucet

- Single Sink Bowl provided with K-50 Swing Spout Faucet
- Double Sink Bowls provided with K-53 Swing Spout Faucet

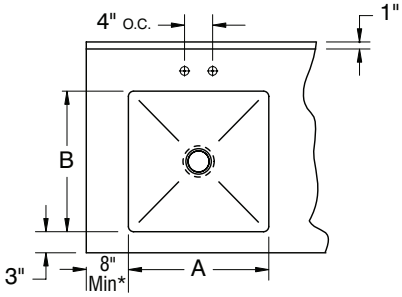
10" Backsplash Include Splash Mount Faucet

- Single & Double Sink Bowls provided with K-1 Swing Spout Faucet
  Splash Mount Faucet Available On 5" Backsplash - Add TA-11Z

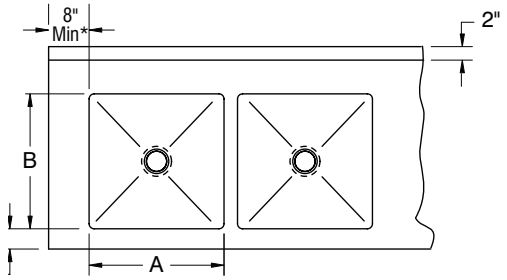
FLAT TOP, 1" or 1-1/2" REAR SPLASH



5" REAR SPLASH with 1" RETURN



10" REAR SPLASH with 2" RETURN



*4" minimum on enclosed base tables

⚠ **WARNING:** Equipment that include faucets on this page may contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

Faucets & Accessories

_____	K-2B	Poly-Vance Sink Cutting Board for 14" x 16" Deep Drawn Bowls
_____	K-2C	Poly-Vance Sink Cutting Board for 16" x 20" Deep Drawn Bowls
_____	K-2D	Poly-Vance Sink Cutting Board for 18" x 24" Deep Drawn Bowls
_____	K-2E	Poly-Vance Sink Cutting Board for 20" x 20" Deep Drawn Bowls
_____	K-2F	Poly-Vance Sink Cutting Board for 24" x 24" Deep Drawn Bowls
_____	K-2J	Poly-Vance Sink Cutting Board for 18" x 18" Deep Drawn Bowls
_____	K-4	Lever Drain Bracket
_____	K-5	Lever Drain
_____	K-12	Deck Mounted Soap Dispenser
_____	K-15	Lever Drain With Overflow
_____	K-50	8" Deck Mounted 4" O.C. Swing Spout Faucet
_____	K-50OMIT	Omit Swing Spout
_____	K-52	3 1/2" Spout Deck Mounted 4" O.C. Gooseneck Faucet
_____	K-52OMIT	Omit Swing Spout Gooseneck Faucet
_____	K-53	12" Deck Mounted 4" O.C. Swing Spout Faucet
_____	K-54	8-1/4" Water Filler Faucet
_____	K-54A	12" Water Filler Faucet
_____	K-55	8 1/2" Spout 4" O.C. Deck Mounted Gooseneck Faucet
_____	K-60	4" O.C. Splash Mounted Gooseneck Faucet
_____	K-62	X.H.D. 4" O.C. Deck Mounted Gooseneck Faucet
_____	K-105	14" Splash Mounted 8" O.C. Faucet
_____	K-112	Extra Heavy Duty 12" Splash Mounted Faucets
_____	K-316-LUHA	Wrist Handles For Splash Mounted Faucets
_____	K-350	Residential Finish & Packaging
_____	K-452	6" x 9" Control Bracket
_____	K-453	14" x 16" Control Bracket
_____	K-460	Installation Of Disposal Cone w/ 6" x 9" Control Bracket
_____	K-461	Installation Of Collar w/ 6" x 9" Control Bracket
_____	K-470	14" Deep Bowls
_____	K-472	Faucet Hole Revision
_____	DTA-100	Prerinse Basket for 20" x 20" Bowls
_____	DTA-125	Prerinse Basket for 16" x 20" Bowls

ADVANCE TABCO SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

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ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

ADD-A-TIER DRAWERS

Fits Under 24", 30" and 36" Wide Open Base Work Tables!

FEATURES:

Units come Fully Assembled!

Stainless Steel Drawers feature **SHD Series Drawers** with Integral drawer slides & removable stainless steel drawer inserts.

Includes 2 or 3 drawers with 2 Concealed Side Panels (See Photos).

Drawer "Safety Stop" tab.

Mounts from underside of Open Base Table with Included Hardware.

CONSTRUCTION:

All TIG welded.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer inset.

Self closing drawer with noise control.

MATERIAL:

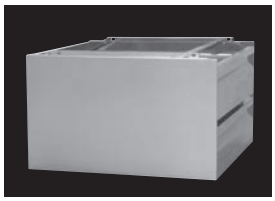
Heavy gauge type 430 series stainless steel.



ADT-3-2020 SERIES SHOWN
(Table not included)

Model #	Description	Weight
ADT-2-2020	2 Tier Drawers	87 lbs.
ADT-3-2020	3 Tier Drawers	105 lbs.
ADT-3-2015	3 Tier Drawers	85 lbs.

INCLUDES 2 CONCEALED SIDE PANELS



2 Drawer Concealed Panel
Model ADT-2-2020 Shown



3 Drawer Concealed Panel
Model ADT-3-2020 Shown



Rear View of Stacked Drawers
Drawer Seams Exposed

STAINLESS STEEL

FACTORY INSTALLED "SHD SERIES" TIER DRAWERS

(FACTORY INSTALLATION ONLY)

FEATURES:

3-Tier Drawers factory installed.

1 5/8" diameter tubular stainless steel legs & gussets.

Stainless Steel Drawers feature **SHD Series Drawers** with Integral Drawer Slides & removable stainless steel drawer inserts.

Drawer "Safety Stop" tab.

CONSTRUCTION:

All TIG welded.

Legs bolt on to table base.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer insert.

Self closing drawer with noise control.

MATERIAL:

Heavy gauge type 430 series stainless steel.

LEGS are stainless steel and include 1 1/2" adjustable hex foot.

New 4 Tier Unit Offers
33% Greater Storage, within the
Same Overall Dimension!



TA-38 SHOWN

Model #	Description	Weight
TA-38	3-Tier Drawers	130 lbs.
TA-384	4-Tier Drawers	165 lbs.

FEATURING BOLT-ON
STAINLESS STEEL LEG

For Tier Drawers on 24" Wide Enclosed Base Tables, Add **TA-380** (Drawers will be 20" x 15" x 5")

ADVANCE TABCO
SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

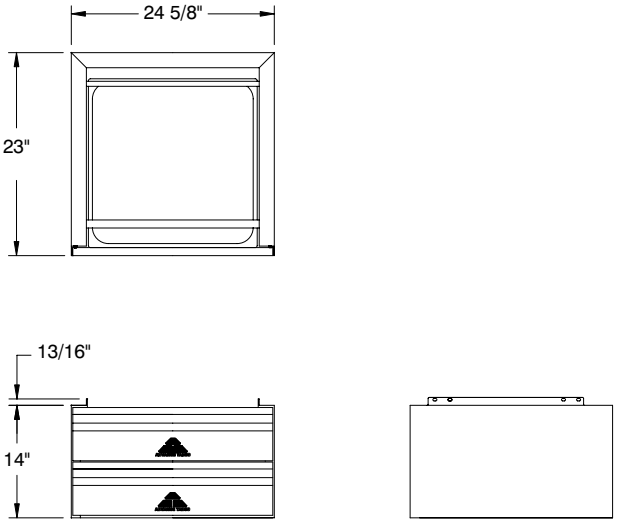
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

DETAILS and SPECIFICATIONS

TOL ± .500”

ALL DIMENSIONS ARE TYPICAL

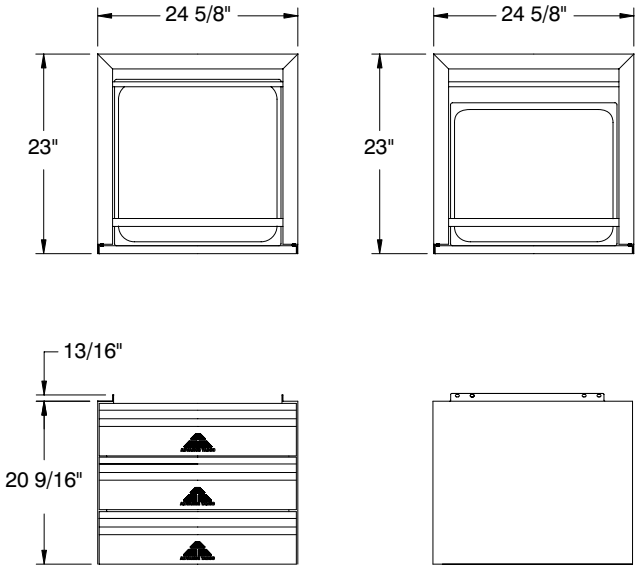
ADT-2-2020



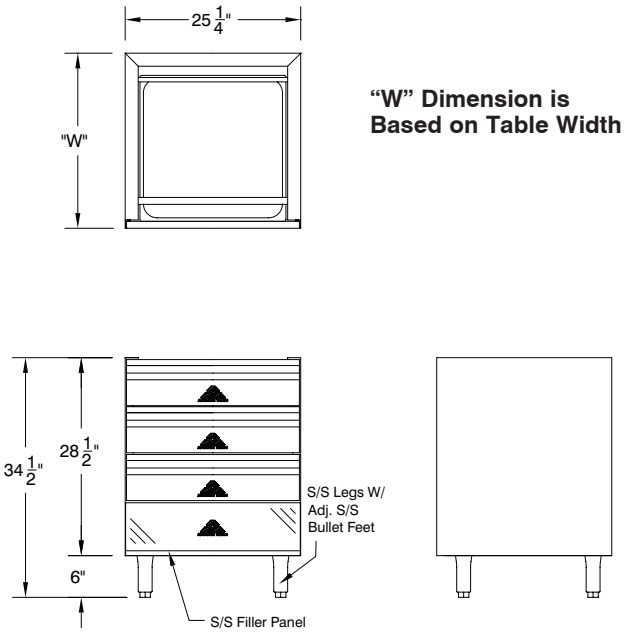
ADT-3-2015
ADT-3-2020

TOP VIEW OF ADT-3-2020

TOP VIEW OF ADT-3-2015

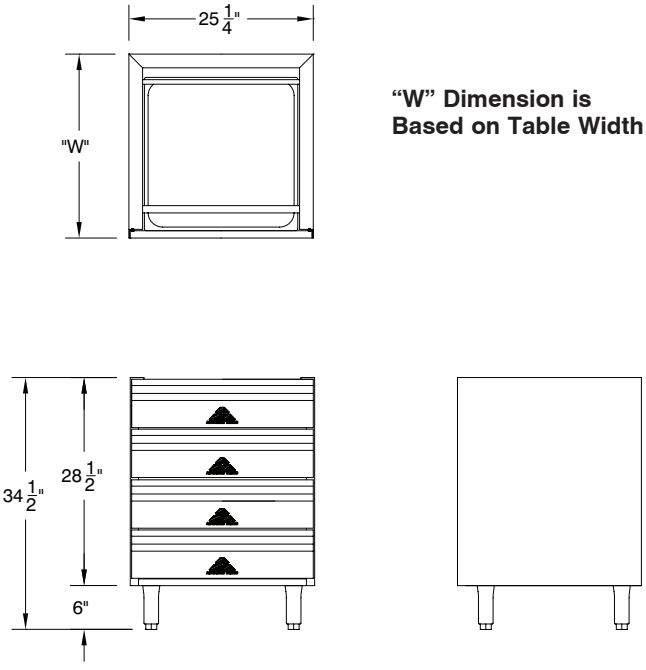


TA-38 THREE TIER UNIT



“W” Dimension is Based on Table Width

TA-384 FOUR TIER UNIT



“W” Dimension is Based on Table Width

ADVANCE TABCO
SMART FABRICATION™

REF-K 325 Wireless Boulevard, Hauppauge, NY 11788

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, NOVEMBER 2023

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 12 Quantity: 2
Manufacturer: ADVANCE TABCO
Model: WS-15-120-16-X
Description: WALL SHELF

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

WALL SHELVES

NSF



Item #: _____ Qty #: _____

Model #: _____

Project #: _____



FEATURES:

Brackets can be positioned to accommodate wall studs.

Furnished with a 1-5/8" Bullnose edge with a 1-1/2" turn-up edge at rear. Ends are turned down square.

MATERIAL:

16 Gauge Series - 304 stainless steel polished to a satin finish.

18 Gauge Series - 430 stainless steel polished to a satin finish.

CONSTRUCTION:

Secured to wall by means of bolts through support brackets.

Units 7 ft. and larger are furnished with 3 brackets.

	10" Wide			12" Wide			15" Wide			18" Wide			
L	16 Ga.	18 Ga.	Approx. Wt.	16 Ga.	18 Ga.	Approx. Wt.	16 Ga.	18 Ga.	Approx. Wt.	16 Ga.	18 Ga.	Approx. Wt.	Approx. Cu. Ft.
24"	WS-10-24-16	WS-10-24	8 lbs.	WS-12-24-16	WS-12-24	9 lbs.	WS-15-24-16	WS-15-24	11 lbs.	WS-18-24-16	WS-18-24	14 lbs.	3
30"	-	-	-	WS-12-30-16	WS-12-30	12 lbs.	-	-	-	-	-	-	4
36"	WS-10-36-16	WS-10-36	10 lbs.	WS-12-36-16	WS-12-36	12 lbs.	WS-15-36-16	WS-15-36	15 lbs.	WS-18-36-16	WS-18-36	21 lbs.	4
42"	-	-	-	WS-12-42-16	WS-12-42	14 lbs.	-	-	-	-	-	-	5
48"	WS-10-48-16	WS-10-48	12 lbs.	WS-12-48-16	WS-12-48	14 lbs.	WS-15-48-16	WS-15-48	18 lbs.	WS-18-48-16	WS-18-48	24 lbs.	5
60"	WS-10-60-16	WS-10-60	15 lbs.	WS-12-60-16	WS-12-60	17 lbs.	WS-15-60-16	WS-15-60	23 lbs.	WS-18-60-16	WS-18-60	28 lbs.	6
72"	WS-10-72-16	WS-10-72	17 lbs.	WS-12-72-16	WS-12-72	21 lbs.	WS-15-72-16	WS-15-72	28 lbs.	WS-18-72-16	WS-18-72	32 lbs.	7
84"	WS-10-84-16	WS-10-84	20 lbs.	WS-12-84-16	WS-12-84	25 lbs.	WS-15-84-16	WS-15-84	32 lbs.	WS-18-84-16	WS-18-84	36 lbs.	8
96"	WS-10-96-16	WS-10-96	23 lbs.	WS-12-96-16	WS-12-96	28 lbs.	WS-15-96-16	WS-15-96	36 lbs.	WS-18-96-16	WS-18-96	42 lbs.	10
108"	WS-10-108-16	WS-10-108	28 lbs.	WS-12-108-16	WS-12-108	32 lbs.	WS-15-108-16	WS-15-108	40 lbs.	WS-18-108-16	WS-18-108	48 lbs.	11
120"	WS-10-120-16	WS-10-120	32 lbs.	WS-12-120-16	WS-12-120	36 lbs.	WS-15-120-16	WS-15-120	44 lbs.	WS-18-120-16	WS-18-120	54 lbs.	12
132"	WS-10-132-16	WS-10-132	36 lbs.	WS-12-132-16	WS-12-132	42 lbs.	WS-15-132-16	WS-15-132	49 lbs.	WS-18-132-16	WS-18-132	60 lbs.	13
144"	WS-10-144-16	WS-10-144	40 lbs.	WS-12-144-16	WS-12-144	48 lbs.	WS-15-144-16	WS-15-144	55 lbs.	WS-18-144-16	WS-18-144	66 lbs.	14

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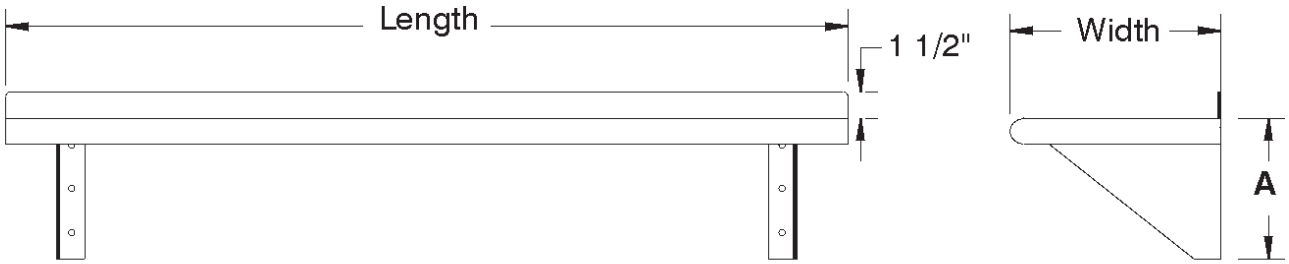
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DETAILS and SPECIFICATIONS

TOL ± .500”

ALL DIMENSIONS ARE TYPICAL



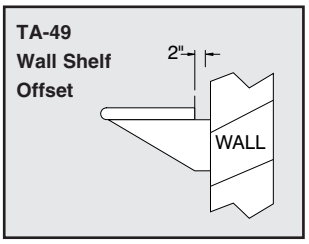
Width	A
10”	8 1/2”
12”	10 1/2”
15”	13 1/2”
18”	16 1/2”

Load Capacity = 20 lbs. per sq. ft.

(Evenly Distributed Weight)

Wall Shelf Options

PRT-1	Printer Shelf
TA-22A	Square Edge Shelf
TA-26	Welded Shelf Brackets
TA-49	Wall Shelf 2” Offset
TA-71	Heat Lamp Provision
TA-77	Check Minder
TA-77A	Concealer for Heat Lamp (Requires TA-77)
TA-99A	14 Ga. S/S 304 Upgrade for Overshelves
TA-100A	Bullnose Edge On All 4 Sides of Shelf
TA-102	6” Cantilever Shelf Offset





ADVANCE TABCO

325 Wireless Boulevard, Hauppauge, NY 11788

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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 13 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: KLAG-307-X
Description: WORKTABLE

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Special Value Work Table, 84"W x 30"D, 16 gauge 430 stainless steel top with 5"H backsplash, 18 gauge galvanized adjustable undershelf, galvanized legs with adjustable plastic bullet feet, NSF 2 ea Model ADT-2-2020 Drawer Assembly, (2) tier, 20"W x 20"D x 5" deep removable stainless steel drawer inserts, roller bearing drawer slides, self closing drawers with noise control, concealed side panels, 430 stainless steel, all TIG welded & fully assembled, NSF

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

ECONOMY WORK TABLES

NSF

Item #: _____ Qty #: _____

Model #: _____

Project #: _____

FEATURES:

ELAG Top is furnished with 1 5/8" sanitary rolled rim on front and rear & square ends.

FLAG Top is furnished with 1 5/8" sanitary rolled rim on front and square ends, and 1 1/2" backsplash on rear.

KLAG Top is furnished with 1 5/8" sanitary rolled rim on front and square ends, and 5" backsplash at rear.

Two hat-channels stud welded under tabletop to reinforce and maintain a level work surface.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is fully adjustable.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surface.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat channels.

MATERIAL:

TOP: 16 gauge stainless steel type "430" series.
SHELF: 18 gauge galvanized steel.
LEGS: 1 5/8" diameter tubular galvanized steel. Galvanized steel gussets. 1" adjustable plastic bullet feet.



ELAG-X Series
Flat Top



Plastic Bullet Feet standard on ELAG, FLAG & KLAG Series



FLAG-X Series
1 1/2" Backsplash



KLAG-X Series
5" Backsplash

MADE IN THE USA

	L	Model #	WT.	Cu. Ft.	Model #	WT.	Cu. Ft.	Model #	WT.	Cu. Ft.
		FLAT TOP			**1 1/2" SPLASH**			**5" SPLASH**		
18" WIDE	24"	ELAG-182-X	37 lbs.	4	-			-		
	30"	ELAG-180-X	44 lbs.	4	-			-		
	36"	ELAG-183-X	47 lbs.	4	-			-		
	48"	ELAG-184-X	58 lbs.	5	-			-		
	60"	ELAG-185-X	66 lbs.	7	-			-		
	72"	ELAG-186-X	79 lbs.	8	-			-		
24" WIDE	24"	ELAG-242-X	44 lbs.	4	FLAG-242-X	44 lbs.	4	KLAG-242-X	48 lbs.	7
	30"	ELAG-240-X	50 lbs.	4	FLAG-240-X	50 lbs.	4	KLAG-240-X	55 lbs.	7
	36"	ELAG-243-X	56 lbs.	4	FLAG-243-X	56 lbs.	4	KLAG-243-X	61 lbs.	7
	48"	ELAG-244-X	69 lbs.	6	FLAG-244-X	69 lbs.	6	KLAG-244-X	75 lbs.	9
	60"	ELAG-245-X	80 lbs.	7	FLAG-245-X	80 lbs.	7	KLAG-245-X	89 lbs.	11
	72"	ELAG-246-X	95 lbs.	8	FLAG-246-X	95 lbs.	8	KLAG-246-X	102 lbs.	13
	84"	ELAG-247-X	108 lbs.	10	FLAG-247-X	108 lbs.	10	KLAG-247-X	117 lbs.	15
	96"	ELAG-248-X*	112 lbs.	11	FLAG-248-X*	112 lbs.	11	KLAG-248-X*	137 lbs.	17
30" WIDE	24"	ELAG-302-X	49 lbs.	5	FLAG-302-X	49 lbs.	5	KLAG-302-X	53 lbs.	8
	30"	ELAG-300-X	56 lbs.	5	FLAG-300-X	56 lbs.	5	KLAG-300-X	61 lbs.	8
	36"	ELAG-303-X	64 lbs.	5	FLAG-303-X	64 lbs.	5	KLAG-303-X	69 lbs.	8
	48"	ELAG-304-X	79 lbs.	7	FLAG-304-X	79 lbs.	7	KLAG-304-X	84 lbs.	11
	60"	ELAG-305-X	95 lbs.	8	FLAG-305-X	95 lbs.	8	KLAG-305-X	101 lbs.	13
	72"	ELAG-306-X	110 lbs.	10	FLAG-306-X	110 lbs.	10	KLAG-306-X	117 lbs.	16
	84"	ELAG-307-X	125 lbs.	12	FLAG-307-X	125 lbs.	12	KLAG-307-X	133 lbs.	18
	96"	ELAG-308-X*	131 lbs.	13	FLAG-308-X*	131 lbs.	13	KLAG-308-X*	140 lbs.	20
36" WIDE	36"	ELAG-363-X	73 lbs.	6	FLAG-363-X	73 lbs.	6	-		
	48"	ELAG-364-X	92 lbs.	8	FLAG-364-X	92 lbs.	8	-		
	60"	ELAG-365-X	111 lbs.	10	FLAG-365-X	111 lbs.	10	-		
	72"	ELAG-366-X	130 lbs.	12	FLAG-366-X	130 lbs.	12	-		
	96"	ELAG-368-X*	158 lbs.	15	FLAG-368-X*	158 lbs.	15	-		

All 8 ft. Tables Provided With 6 Legs

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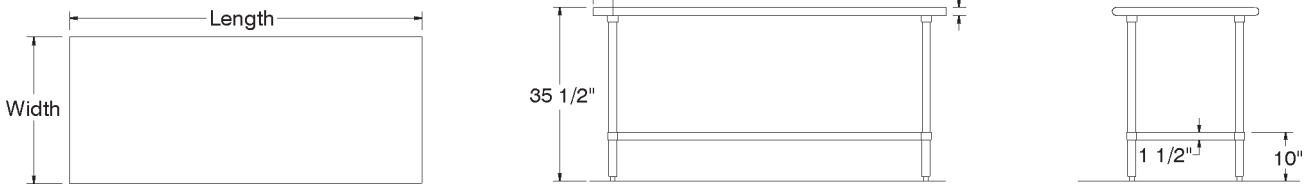
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DETAILS and SPECIFICATIONS

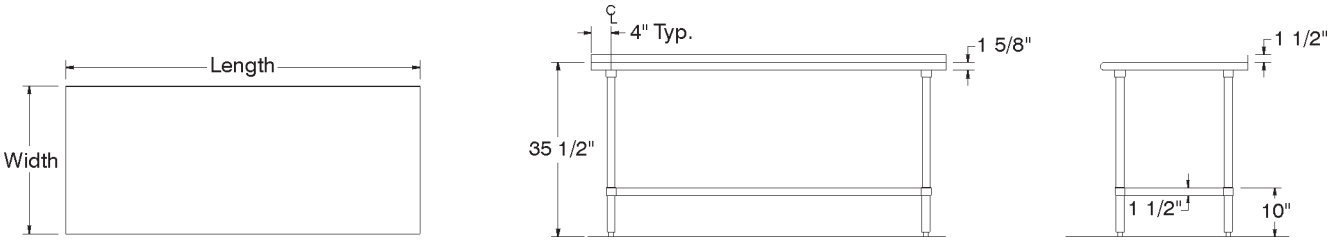
TOL ± .500”

ALL DIMENSIONS ARE TYPICAL

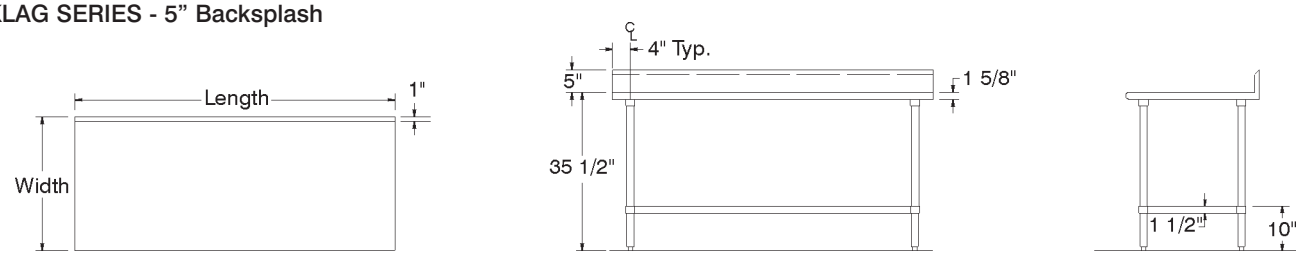
ELAG SERIES - Flat Top



FLAG SERIES - 1 1/2” Backsplash



KLAG SERIES - 5” Backsplash



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SMART FABRICATION™
325 Wireless Boulevard, Hauppauge, NY 11788

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© ADVANCE TABCO, AUGUST 2019

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

ADD-A-TIER DRAWERS

Fits Under 24", 30" and 36" Wide Open Base Work Tables!

FEATURES:

Units come Fully Assembled!

Stainless Steel Drawers feature **SHD Series Drawers** with Integral drawer slides & removable stainless steel drawer inserts.

Includes 2 or 3 drawers with 2 Concealed Side Panels (See Photos).

Drawer "Safety Stop" tab.

Mounts from underside of Open Base Table with Included Hardware.

CONSTRUCTION:

All TIG welded.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer inset.

Self closing drawer with noise control.

MATERIAL:

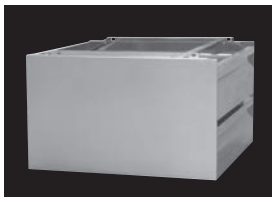
Heavy gauge type 430 series stainless steel.



ADT-3-2020 SERIES SHOWN
(Table not included)

Model #	Description	Weight
ADT-2-2020	2 Tier Drawers	87 lbs.
ADT-3-2020	3 Tier Drawers	105 lbs.
ADT-3-2015	3 Tier Drawers	85 lbs.

INCLUDES 2 CONCEALED SIDE PANELS



2 Drawer Concealed Panel
Model ADT-2-2020 Shown



3 Drawer Concealed Panel
Model ADT-3-2020 Shown



Rear View of Stacked Drawers
Drawer Seams Exposed

STAINLESS STEEL

FACTORY INSTALLED "SHD SERIES" TIER DRAWERS

(FACTORY INSTALLATION ONLY)

FEATURES:

3-Tier Drawers factory installed.

1 5/8" diameter tubular stainless steel legs & gussets.

Stainless Steel Drawers feature **SHD Series Drawers** with Integral Drawer Slides & removable stainless steel drawer inserts.

Drawer "Safety Stop" tab.

CONSTRUCTION:

All TIG welded.

Legs bolt on to table base.

MECHANICAL:

Roller bearing slides, drawer enclosure and removable drawer insert.

Self closing drawer with noise control.

MATERIAL:

Heavy gauge type 430 series stainless steel.

LEGS are stainless steel and include 1 1/2" adjustable hex foot.

New 4 Tier Unit Offers
33% Greater Storage, within the
Same Overall Dimension!



TA-38 SHOWN

Model #	Description	Weight
TA-38	3-Tier Drawers	130 lbs.
TA-384	4-Tier Drawers	165 lbs.

FEATURING BOLT-ON
STAINLESS STEEL LEG

For Tier Drawers on 24" Wide Enclosed Base Tables, Add **TA-380** (Drawers will be 20" x 15" x 5")

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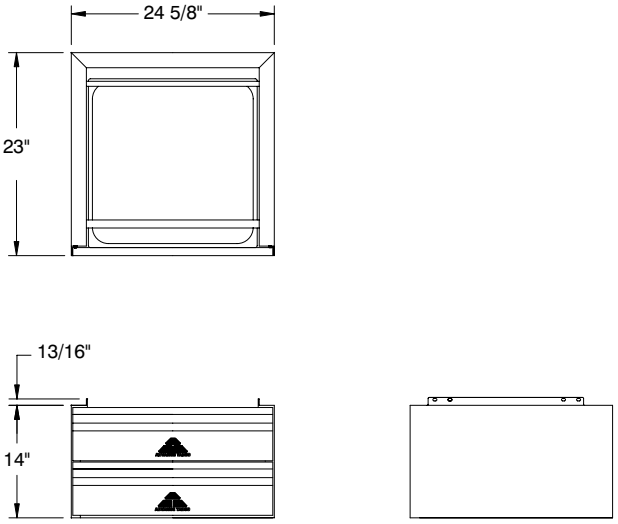
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DETAILS and SPECIFICATIONS

TOL ± .500”

ALL DIMENSIONS ARE TYPICAL

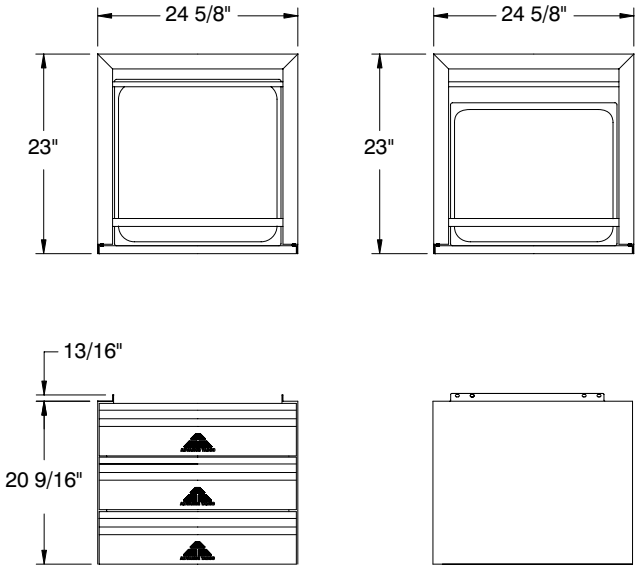
ADT-2-2020



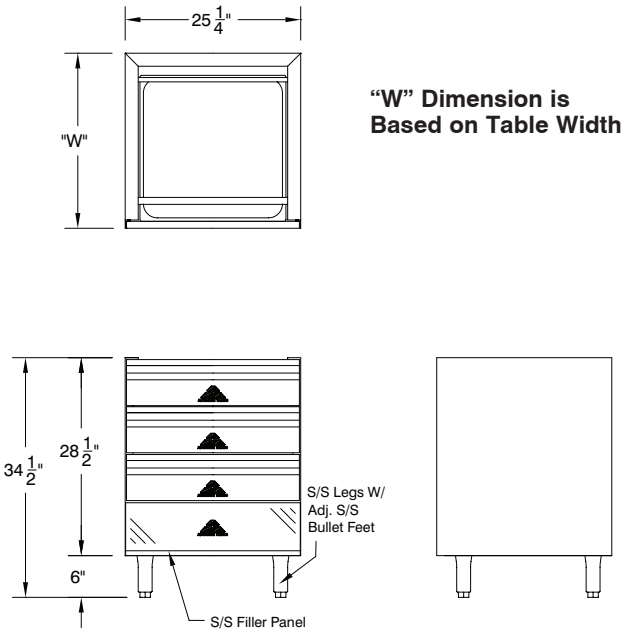
ADT-3-2015
ADT-3-2020

TOP VIEW OF ADT-3-2020

TOP VIEW OF ADT-3-2015

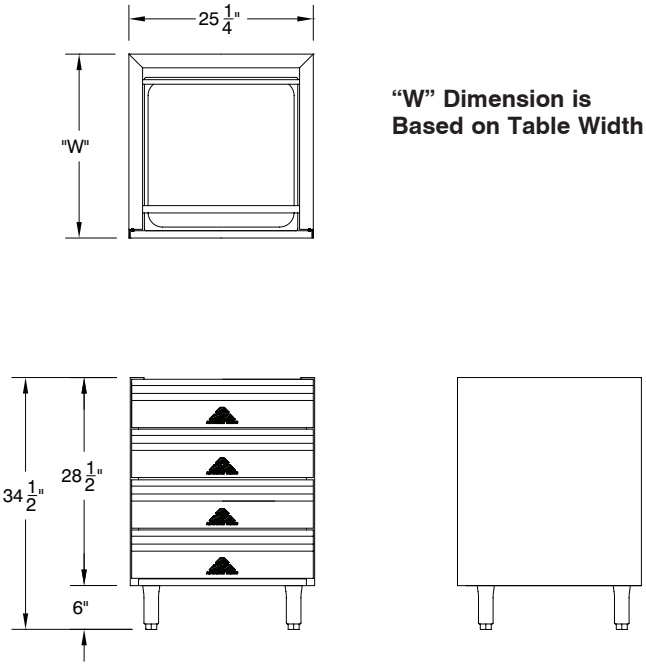


TA-38 THREE TIER UNIT



“W” Dimension is Based on Table Width

TA-384 FOUR TIER UNIT



“W” Dimension is Based on Table Width

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REF-K 325 Wireless Boulevard, Hauppauge, NY 11788

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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 14 Quantity: 2
Manufacturer: CAMBRO
Model: EWS36PREP110
Description: WALL GRID

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

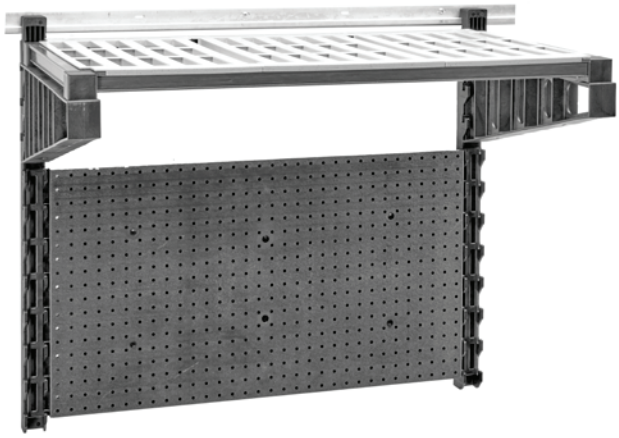
Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Camshelving® Elevation Series Wall Shelving Prep Station Starter Kit, 18" x 36" x 30-1/4", includes: (1) 40" aluminum wall track, (2) 30" wall uprights, (2) 18" deep universal shelf brackets, (1) 18" x 36" vented shelf with CamGuard® antimicrobial shelf plates, (1) 18" x 36" hanging pegboard, 304 stainless steel accessories: (2) large wire baskets, (1) small shelf/lid holder, (1) cylinder and holder & (8) peg hooks, black, NSF

Reviewer's Stamp:

Camshelving® Elevation Series Wall Shelving

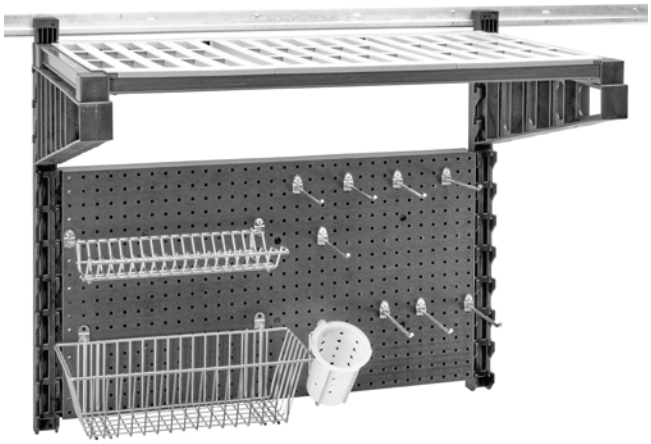
Installation Guide



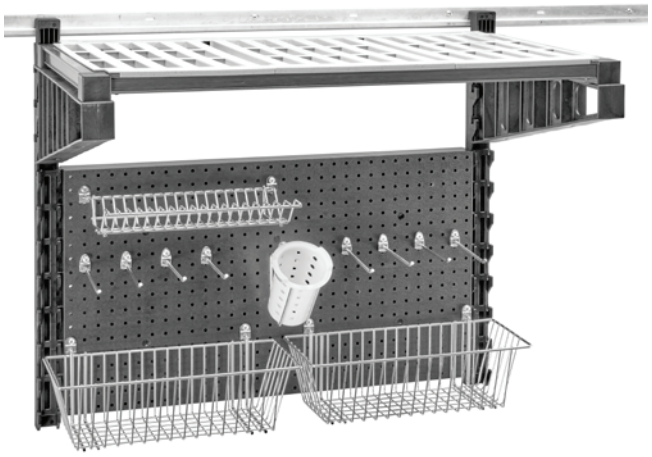
Task Station Starter Kit



Task Station Add-On Kit



Sink Station Starter Kit



Prep Station Starter Kit

(Sink and Prep Station Add-On Kits Available)

Videos/Guides in Multiple Languages

CAMBRO®

www.cambro.com

CAUTION! PLEASE READ PRIOR TO INSTALLATION!

• To facilitate the installation of Cambro Elevation Wall Shelving System, properly secure it to an adjacent wall using a professional installation company or your company's qualified Maintenance or Engineering personnel to ensure adequate wall securement, adhere to proper load bearing requirements, and to avoid all utilities.

• Mounting of tracks, uprights, and wall mounted peg boards solely to drywall is NOT recommended.

• The first and last holes in a continuous length of wall track MUST BE installed into a wood stud or acceptable reinforcement (blocking) with appropriate hardware.

• If 12" (30 cm) or more of the track extends beyond a wood wall stud, the section of wall between the studs MUST BE appropriately blocked to provide the wall track with a secure surface to complete the installation.

• Appropriate hardware must be installed AT LEAST every 16" (40 cm) (on each stud) along the track.

• When installing uprights WITHOUT track, the first and last holes in each upright MUST be installed into a wood stud or appropriate reinforcement (blocking) with appropriate hardware.

• Wall tracks, uprights and wall mounted peg boards ARE NOT designed to replace additional structural support for walls. Installers should use discretion and properly reinforce walls before installing wall tracks, uprights, and wall mounted peg boards.

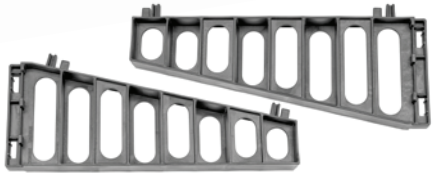
• HARDWARE NOT INCLUDED with wall shelving products.

• NOTICE: Regular inspections of product after installation is highly recommended. Tighten loose fasteners and replace damaged parts with new approved Cambro parts. All parts can be easily removed for cleaning and are commercial dishwasher safe.

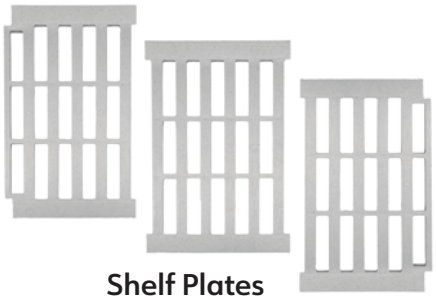
Wall Shelving Components



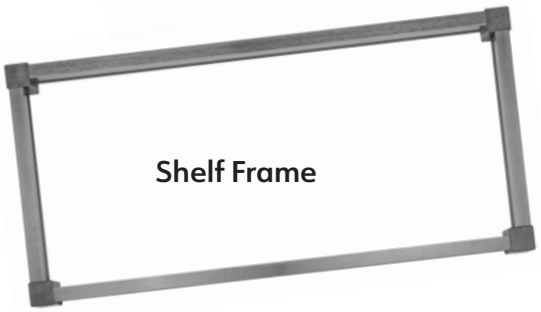
Wall Track



Shelf Bracket
(straight and angled)



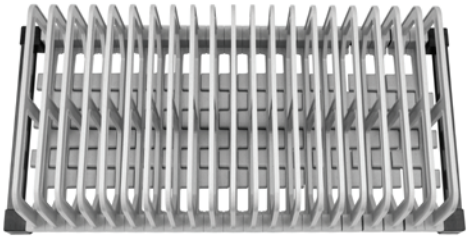
Shelf Plates
(available in vented or solid)



Shelf Frame



Hanging Pegboard



Drying Rack Shelf



Wall Uprights



Shelf Rail Kits



Wall-Mounted Pegboard

WEIGHT-BEARING CAPACITY*

Station Kits, Custom Storage, Shelves & Pegboards	Weight-Bearing
All Station Kits or Single Custom Storage Section with Wall Track, Two Uprights, 2 Shelf Brackets and any Combination of Shelves, Pegboards and Accessories.	400 lbs. (181 kg) Per Kit/Section
All Add-On Station Kits or Shared Custom Storage Section with Wall Track, One Upright, One Shelf Bracket and Any Combination of Shelves, Pegboards and Accessories.	200 lbs. (90 kg) Per Kit/Section
Shelf Only, Single Kit with 2 Shelf Brackets	250 lbs. (113 kg) Per Shelf
Shelf Only, Add-On Kit with 1 Shelf Bracket	150 lbs. (68 kg) Per Shared Shelf
Pegboard (Hanging or Wall-Mounted)	100 lbs. (45 kg)

*Weight bearing capacities based on following cautionary recommendations on prior page and installation by professional installation company or qualified maintenance/engineering personnel.

How to Install WALL STORAGE PRODUCTS

1. Install WALL TRACK to the WALL

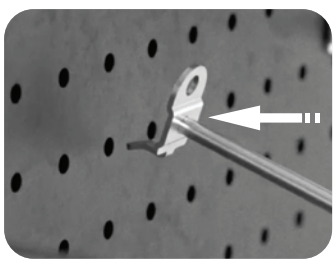
a) Use a leveling device to ensure track is level and installed correctly on the wall.
IMPORTANT: Pay strict attention to all CAUTION information.
b) Install and secure into the wall using appropriate hardware.

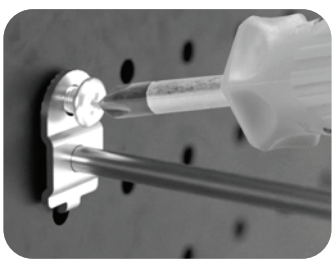
2. Install WALL UPRIGHTS, SHELVES and HANGING PEGBOARD

a) Hang wall uprights from track.
b) Attach shelf brackets.
c) Install shelf frame on shelf brackets and attach pegboard to hooks on wall uprights.
d) Secure uprights to wall as needed with appropriate hardware.
e) Install shelf plates, optional shelf rails or other shelf accessories, and/or pegboard accessories.

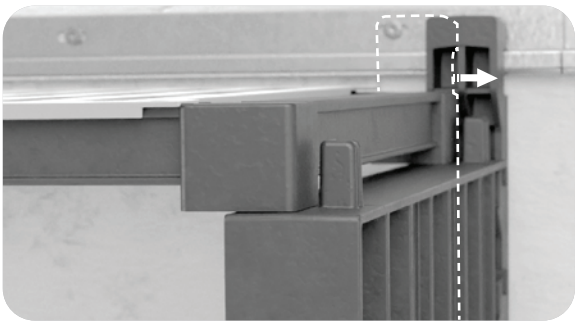
3. Install PEGBOARD ACCESSORIES

a) Determine best location for each.
b) Use Phillips Head #2 Screwdriver to install screws as shown.





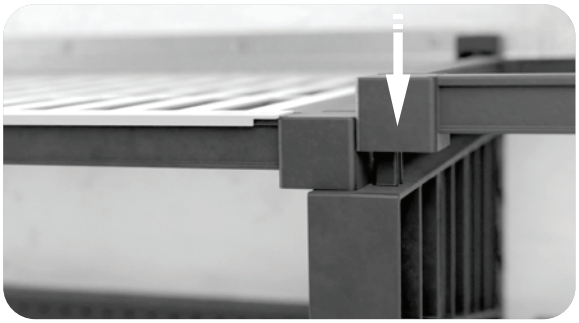
How to Install Add-On Shelf Kit & Hanging Pegboard on Shared Wall Upright



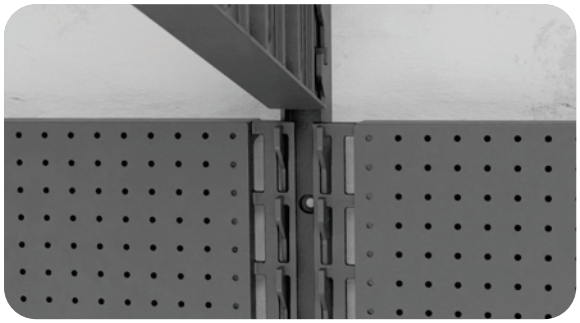
1. Slide wall upright over to the right. Lift shelf frame up and onto the shelf bracket pegs as shown.



2. Remove pegboard off hooks and re-install as shown.

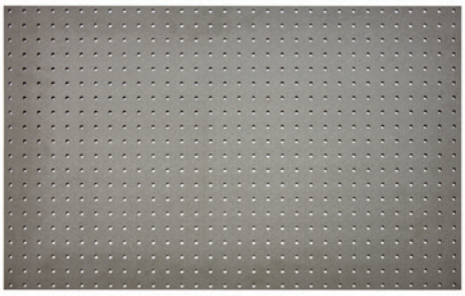


3. Install add-on shelf frame onto the shared shelf bracket as shown.



4. Hang pegboard onto the hooks on the shared upright as shown and onto the outside upright.

How to Install Wall Mounted Pegboard Between Uprights



1. Hold pegboard flat on wall centered between uprights.
2. Use level to ensure board is level and square before marking holes for screws.
3. Use pencil or drill bit to mark locations for the screws through the pegboard onto the wall.
4. Recommended screws required per pegboard length:
    a. 24" – 36" (610-915 mm) – 1 in each corner and 1 in center.
    b. 42" – 48" (1070 – 1220 mm) – 3 evenly spaced across top and bottom plus 4 in middle, triangle pattern.
5. Use power drill with 5/16" (0,8 cm) drill bit to make pilot holes. NOTE: Not required if installing screws into wood wall stud.
6. Insert plastic wall anchors into pre-drilled holes.



7. Place screws thru pegboard holes. Add spacer in the back of each screw. Insert screw into each wall anchor or assigned hole location. Use #2 Phillips head screwdriver to install screws halfway. Then, tighten all screws until spacers are snug against wall surface. Do not overtighten. Review installation drawings and hardware included with each kit.

NSF COMPONENT

PATENT APPLIED FOR

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UMEWS

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D062420

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 15 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: KLG-306
Description: WORK TABLE

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	X	¾"	☐			
Hot Water	½"	X	3/4"	☐			
140	☐		180	☐			

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink X X
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
Work Table, 72"W x 30"D, 16 gauge 430 stainless steel top with 5"H backsplash, 18 gauge galvanized adjustable undershelf, galvanized legs with adjustable bullet feet, NSF
1 ea Model TA-31 Side Splash, 5" high (each)
1 ea Weld-In sink - single bowl
1 ea Model TA-11Q Sink Welded Into Table Top, 10"W x 14"D x 5" deep bowl, includes faucet,
NSF (must specify sink location)

Reviewer's Stamp:

STAINLESS STEEL

WORK TABLES

PREMIUM Series - 5" Backsplash - Undershelf Style



Item #: _____ Qty #: _____

Model #: _____

Project #: _____



Rolled Rim Edges on Front & Splash on Back and Square Side Edges



Featuring as Standard:
"THE PROVEN"
ORIGINAL ADVANCE TABCO
Adjustable Undershelf with Die Cast Leg Clamp

FEATURES:

Top is furnished with a 1 5/8" sanitary rolled rim edge on front, 1 5/8" square side edges, and a 5" splash with a 1" return on the rear side.

24" wide tables supplied with TWO hat channels stud welded to reinforce and maintain a level working surface. 30" and 36" wide tables supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future drawer installation.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is adjustable.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat sections.

MATERIAL:

KSS-SERIES: Stainless Steel Legs & Undershelf

TOP: 14 gauge stainless steel type "304" series.
SHELF: 18 gauge stainless steel.
LEGS: 1 5/8" diameter tubular stainless steel.
1" adjustable stainless steel bullet feet.
Stainless steel gussets.

KLG-SERIES: Galvanized Legs & Undershelf

TOP: 14 gauge stainless steel type "304" series.
SHELF: 18 gauge galvanized steel.
LEGS: 1 5/8" diameter tubular galvanized steel.
1" adjustable plastic bullet feet.
Galvanized steel gussets.

KSS-Series:
Stainless Steel Legs & Undershelf

L	24" Wide	30" Wide	36" Wide
30"	KSS-240	KSS-300	
24"	KSS-242	KSS-302	KSS-362
36"	KSS-243	KSS-303	KSS-363
48"	KSS-244	KSS-304	KSS-364
60"	KSS-245	KSS-305	KSS-365
72"	KSS-246	KSS-306	KSS-366
84"	KSS-247	KSS-307	KSS-367
*96"	KSS-248	KSS-308	KSS-368
*108"	KSS-249	KSS-309	KSS-369
*120"	KSS-2410	KSS-3010	KSS-3610
*132"	KSS-2411	KSS-3011	KSS-3611
*144"	KSS-2412	KSS-3012	KSS-3612

KLG-Series:
Galvanized Steel Legs & Undershelf

L	24" Wide	30" Wide	36" Wide
30"	KLG-240	KLG-300	
24"	KLG-242	KLG-302	KLG-362
36"	KLG-243	KLG-303	KLG-363
48"	KLG-244	KLG-304	KLG-364
60"	KLG-245	KLG-305	KLG-365
72"	KLG-246	KLG-306	KLG-366
84"	KLG-247	KLG-307	KLG-367
*96"	KLG-248	KLG-308	KLG-368
*108"	KLG-249	KLG-309	KLG-369
*120"	KLG-2410	KLG-3010	KLG-3610
*132"	KLG-2411	KLG-3011	KLG-3611
*144"	KLG-2412	KLG-3012	KLG-3612

*Units 8 ft. and larger are furnished with six (6) legs

Create Your Own Efficient Workstation with the Available Standard Accessories (Visit Section K)

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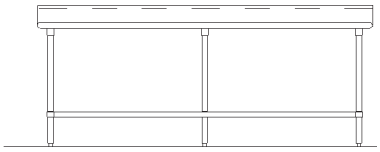
DETAILS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL TOL ± .500”

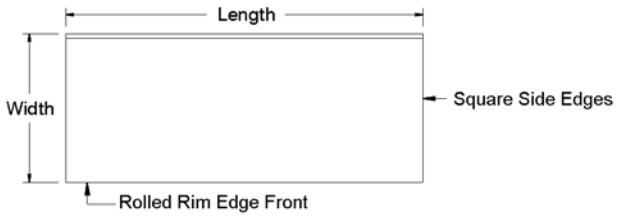
All Units Shipped Unassembled (KD) for Reduced Shipping Costs.

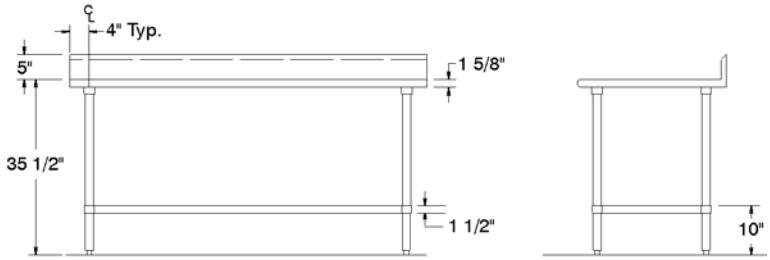
KSS & KLG Series
Undershelf Style
5” Backsplash

Finished size of undershelf = Length minus 5 3/4”
Width minus 5 3/4”



Units 8ft. and larger are furnished with six (6) legs





KSS-Series: Stainless Steel Legs & Undershelf

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	KSS-240	55 lbs.	KSS-300	70 lbs.		
24”	KSS-242	50 lbs.	KSS-302	56 lbs.	KSS-362	86 lbs.
36”	KSS-243	66 lbs.	KSS-303	77 lbs.	KSS-363	92 lbs.
48”	KSS-244	81 lbs.	KSS-304	92 lbs.	KSS-364	101 lbs.
60”	KSS-245	95 lbs.	KSS-305	111 lbs.	KSS-365	121 lbs.
72”	KSS-246	113 lbs.	KSS-306	129 lbs.	KSS-366	142 lbs.
84”	KSS-247	135 lbs.	KSS-307	153 lbs.	KSS-367	169 lbs.
96”	KSS-248	150 lbs.	KSS-308	171 lbs.	KSS-368	189 lbs.
108”	KSS-249	165 lbs.	KSS-309	195 lbs.	KSS-369	260 lbs.
120”	KSS-2410	268 lbs.	KSS-3010	294 lbs.	KSS-3610	315 lbs.
132”	KSS-2411	301 lbs.	KSS-3011	331 lbs.	KSS-3611	358 lbs.
144”	KSS-2412	316 lbs.	KSS-3012	346 lbs.	KSS-3612	373 lbs.

KLG-Series: Galvanized Steel Legs & Undershelf

L	24” Wide	Wt.	30” Wide	Wt.	36” Wide	Wt.
30”	KLG-240	55 lbs.	KLG-300	70 lbs.		
24”	KLG-242	50 lbs.	KLG-302	56 lbs.	KLG-362	86 lbs.
36”	KLG-243	66 lbs.	KLG-303	77 lbs.	KLG-363	92 lbs.
48”	KLG-244	81 lbs.	KLG-304	92 lbs.	KLG-364	101 lbs.
60”	KLG-245	95 lbs.	KLG-305	111 lbs.	KLG-365	121 lbs.
72”	KLG-246	113 lbs.	KLG-306	129 lbs.	KLG-366	142 lbs.
84”	KLG-247	135 lbs.	KLG-307	153 lbs.	KLG-367	169 lbs.
96”	KLG-248	150 lbs.	KLG-308	171 lbs.	KLG-368	189 lbs.
108”	KLG-249	165 lbs.	KLG-309	195 lbs.	KLG-369	260 lbs.
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132”	KLG-2411	301 lbs.	KLG-3011	331 lbs.	KLG-3611	358 lbs.
144”	KLG-2412	316 lbs.	KLG-3012	346 lbs.	KLG-3612	373 lbs.

ADVANCE TABCO
SMART FABRICATION™
325 Wireless Boulevard, Hauppauge, NY 11788

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, APRIL 2021

Welded Sinks Into Table Top

Sink Bowls

Item #: _____ Qty #: _____

Model #: _____

Project #: _____



Flat Top w/ K-50 Deck Mount Faucet Shown



10" Backsplash w/ K-1 Splash Mount Faucet Shown

Includes Faucet & **K-6** 3-1/2" Basket Drain(s)

Size A	Size B	Single Bowl Model#	Double Bowl Model#
10"	14" x 5"	TA-11Q	TA-11Q-2†
10"	14" x 10"	TA-11F	TA-11F-2†
14"	16" x 12"	TA-11J	TA-11J-2
16"	20" x 8"	TA-11A**	TA-11A-2**
16"	20" x 12"	TA-11B**	TA-11B-2**
16"	20" x 14"	TA-11V**	TA-11V-2**
16"	24" x 14"	TA-11K**	TA-11K-2**
18"	18" x 14"	TA-11N	TA-11N-2
18"	24" x 14"	TA-11L	TA-11L-2
20"	20" x 8"	TA-11C*	TA-11C-2*
20"	20" x 12"	TA-11D*	TA-11D-2*
20"	20" x 14"	TA-11W*	TA-11W-2*
20"	24" x 14"	TA-11P*	TA-11P-2*
30"	20" x 14"	TA-11S*	TA-11S-2*
24"	24" x 14"	TA-11E*	TA-11E-2*
30"	24" x 14"	TA-11T*	TA-11T-2*
36"	24" x 14"	TA-11R*	TA-11R-2*
28"	20" x 14"	TA-11G*	TA-11G-2*

* Only Installed In Tables 30" Wide or Wider

** Bowls Are Turned In 24" Wide Tables

† K-50 Swing Spout Faucet (Double Bowl)

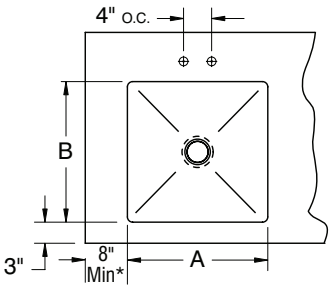
Flat Top, 1", 1-1/2" & 5 Backsplash Include Deck Mount Faucet

- Single Sink Bowl provided with K-50 Swing Spout Faucet
- Double Sink Bowls provided with K-53 Swing Spout Faucet

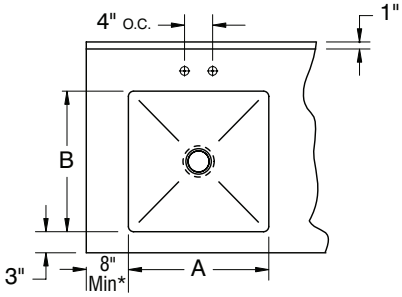
10" Backsplash Include Splash Mount Faucet

- Single & Double Sink Bowls provided with K-1 Swing Spout Faucet
  Splash Mount Faucet Available On 5" Backsplash - Add TA-11Z

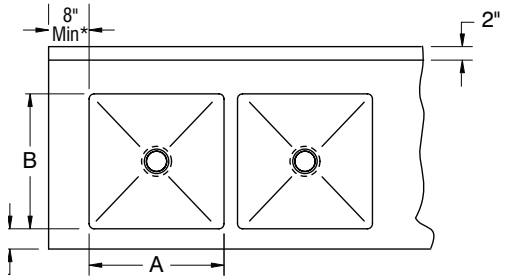
FLAT TOP, 1" or 1-1/2" REAR SPLASH



5" REAR SPLASH with 1" RETURN



10" REAR SPLASH with 2" RETURN



*4" minimum on enclosed base tables

⚠ **WARNING:** Equipment that include faucets on this page may contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

Faucets & Accessories

_____	K-2B	Poly-Vance Sink Cutting Board for 14" x 16" Deep Drawn Bowls
_____	K-2C	Poly-Vance Sink Cutting Board for 16" x 20" Deep Drawn Bowls
_____	K-2D	Poly-Vance Sink Cutting Board for 18" x 24" Deep Drawn Bowls
_____	K-2E	Poly-Vance Sink Cutting Board for 20" x 20" Deep Drawn Bowls
_____	K-2F	Poly-Vance Sink Cutting Board for 24" x 24" Deep Drawn Bowls
_____	K-2J	Poly-Vance Sink Cutting Board for 18" x 18" Deep Drawn Bowls
_____	K-4	Lever Drain Bracket
_____	K-5	Lever Drain
_____	K-12	Deck Mounted Soap Dispenser
_____	K-15	Lever Drain With Overflow
_____	K-50	8" Deck Mounted 4" O.C. Swing Spout Faucet
_____	K-50OMIT	Omit Swing Spout
_____	K-52	3 1/2" Spout Deck Mounted 4" O.C. Gooseneck Faucet
_____	K-52OMIT	Omit Swing Spout Gooseneck Faucet
_____	K-53	12" Deck Mounted 4" O.C. Swing Spout Faucet
_____	K-54	8-1/4" Water Filler Faucet
_____	K-54A	12" Water Filler Faucet
_____	K-55	8 1/2" Spout 4" O.C. Deck Mounted Gooseneck Faucet
_____	K-60	4" O.C. Splash Mounted Gooseneck Faucet
_____	K-62	X.H.D. 4" O.C. Deck Mounted Gooseneck Faucet
_____	K-105	14" Splash Mounted 8" O.C. Faucet
_____	K-112	Extra Heavy Duty 12" Splash Mounted Faucets
_____	K-316-LUHA	Wrist Handles For Splash Mounted Faucets
_____	K-350	Residential Finish & Packaging
_____	K-452	6" x 9" Control Bracket
_____	K-453	14" x 16" Control Bracket
_____	K-460	Installation Of Disposal Cone w/ 6" x 9" Control Bracket
_____	K-461	Installation Of Collar w/ 6" x 9" Control Bracket
_____	K-470	14" Deep Bowls
_____	K-472	Faucet Hole Revision
_____	DTA-100	Prerinse Basket for 20" x 20" Bowls
_____	DTA-125	Prerinse Basket for 16" x 20" Bowls

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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 16 Quantity: 1
Manufacturer:
Model:
Description: DESK

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS, NIKEC

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 17-19 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 20 Quantity: 1
Manufacturer:
Model:
Description: EXHAUST HOOD

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
BY OTHERS; NIKCE

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 21 Quantity: 1
Manufacturer: SOUTHBEND
Model: PCG140S/SD
Description: CONVECTION OVEN

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 7.9 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½	X	¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [X] LP [ ]
Size: ½" [ ] ¾" [X] 1" [ ] 1 ¼" [ ]
BTU: 70,000

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
(QUICK SHIP) Platinum Double Convection Oven, Gas 70,000 BTU's each, Standard Depth, Standard Controls, Dependent Doors 1 ea Quick Ship items have limited configurations & that standard configuration may not apply. Contact factory for details 1 ea Domestic Shipping, inside of North America 1 ea Standard (1) year limited parts and labor warranty (reference warranty document for details) 1 ea Natural Gas 1 ea Standard power system 1 ea (2) 120v/60/1-ph, 7.9 amps, NEMA 5-15P, standard 1 ea 6" Casters in lieu of legs 2 ea Remagen Solutions Model FS-034-K1-48 EasyFlex 3/4" Gas Connection Kit, 48" Length

Reviewer's Stamp:

Job:_____ Item#_____

CONVECTION OVEN PLATINUM SERIES
STANDARD , GAS, DOUBLE DECK

STANDARD	TOUCHSCREEN
☐ PCG100S/S	☐ PCG100S/T
☐ PCG140S/S	☐ PCG140S/T
☐ PCG180S/S	☐ PCG180S/T



PCG100S/T shown with optional casters

Standard Features

- Patented, high efficiency, non-clog Inshot burners
- 50,000 BTU, 70,000 BTU OR 90,000 BTU (NAT or LP) per deck
- Double deck convection oven is 66.8” in height
- Standard or digital Touchscreen Controls with manual, recipe, or rack modes.
- Patented “plug-in, plug-out” control panel - easy to service
- Slide out control panel for full view servicing
- Stainless Steel front, sides and top
- Dependent glass doors (Full 180° opening)
- Energy saving high efficiency glass windows
- Heat keeping dual door seal system
- Coved, fastener-free, porcelain interior
- Stay cool heavy duty door handle
- Soft Air, two speed, 1/2 hp, fan motor
- 11-position rack guides and 5 plated oven racks
- Electronic ignition
- Forced cool down fan mode
- Interior oven lights
- (1) year limited parts and labor warranty (reference http://www.southbendnc.com/service.html for limited warranty details)

Available Controls

SC-Standard Controls

140°F to 500°F solid state thermostat and 60 minute mechanical cook timer.

TC-Touchscreen Controls

150°F to 550°F temperature controller with 140°F to 200°F “Hold” thermostat. Digital display shows time and temperature. A fan cycle timer pulses the fan. Recipes can be created and used in oven group 'Rack' mode to cook multiple items at once on different timers.

OPTIONS & ACCESSORIES AT ADDITIONAL COST

- ☐ List the voltage, frequency, and amps required (see utility information). _____VAC, ____Phase, _____Hz.
- ☐ Stainless steel oven interior
- ☐ Casters 4'" or 6 "
- ☐ Independent doors.
- ☐ Stainless steel exterior bottom
- ☐ Stainless steel dirt tray
- ☐ Marine edge top
- ☐ Export crating
- ☐ Down draft diverter for direct flue
- ☐ 3/4” quick disconnect with flexible hose (specify length: 3ft, 4ft, or 5ft)
- ☐ 2” air insulation panel (stainless steel only)
- ☐ Stainless steel solid doors
- ☐ Stainless steel rear jacket

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Stainless steel front, sides, top and rear jacket.

Doors: Dependent doors with windows. Low emission glass, stainless steel construction, heavy-duty welded steel frame and 5/8” diameter full-length hinge pin.

Oven Interior: Porcelain enamel finish, coved, fastener free.

Rack and Rack Guides: Heavy-duty removable wire rack guides spaced on 1-5/8” centers offer 11 different rack positions. 5 wire racks provided with each oven.

Blower Fan and Motor: 1/2hp, 2-speed motor, 1710/1120 r.p.m

Oven Heating: Oven heating is regulated by an adjustable solid state thermostat control. Jet Stream style burners direct flame towards rear of combustion chamber. Combustion products are drawn into oven interior and recirculated prior to venting.

Electronic Ignition: Hot surface ignitor with flame safety device.

Control Panel: Located on front, at right side of oven, away from heat zone. Slide out panel extends over 17” for easy servicing.

Interior Lights: Two 40 watt high temperature recessed lamps located within the oven cavity.

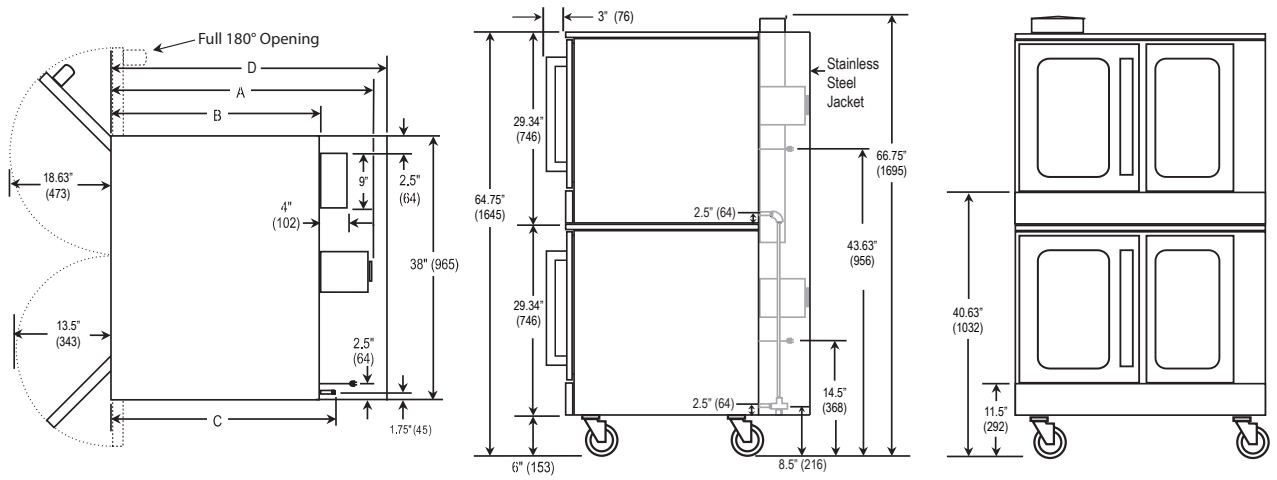
Legs: 6” stainless steel legs standard.

Approval Notes: _____

1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com
Printed in USA Date:_____

Models: ☐ **PCG100S/S** ☐ **PCG140S/S** ☐ **PCG180S/S** ☐ **PCG100S/T** ☐ **PCG140S/T** ☐ **PCG180S/T**

Dimensions shown in inches and (millimeters)



DIMENSIONS

MODEL	DEPTH			OVEN INTERIOR			RACK CLEARANCE		SHIPPING CRATE				
	A	B	C	WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	WIDTH	DEPTH	HEIGHT	VOLUME	WEIGHT
PCG100S/S PCG140S/S PCG180S/S PCG100S/T PCG140S/T PCG180S/T	37.25" (946)	30.25" (768)	39.25" (997)	29" (737)	21.5" (546)	20" (508)	28.25" (718)	21" (533)	57.50" (1461)	45.5" (1156)	81.50" (2070)	123.4 cu. ft. (3.49 cu. m.)	1040 lbs (471.7 kg.)

Dimensions shown in inches and (millimeters)

UTILITY INFORMATION

MODEL	BTU	MINIMUM INLET PRESSURE	
		NATURAL	PROPANE
PCG100S/S PCG100S/T	100,000	7" W.C	11" W.C
PCG140S/S PCG140S/T	140,000	7" W.C	11" W.C
PCG180S/S PCG180S/T	180,000	7" W.C	11" W.C

** one 3/4" female connection.*

ELECTRIC: Standard: 120/60/1 phase, furnished with 6' cord w/3- prong plug (1 plug/deck). NEMA #5-15p. Total maximum amps 7.9 per deck.

Optional: 208/60/1 (190-219 volts). Supply must be wired to junction box with terminal block located at rear. Total maximum amps 4.8 per deck.

Optional: 240/60/1 (220-240 volts). Supply must be wired to junction box with terminal block located at rear. Total maximum amps 4.3 per deck.

Optional: 240/50/1 (208-240 volts). Supply must be wired to junction box with terminal block located at rear. Total maximum amps 6.0 per deck.

** All units shipped single phase.*
Single phase can be easily connected to three phase.

MISCELLANEOUS

- If using flex hose connector, the I.D should not be smaller than 3/4" and must comply with ANSI Z 21.69.
- If casters are used with flex hose, a restraining device should be used to eliminate undue strain on the flex hose.
- Clearances from combustibles: Top-0", bottom-0", right side-0" and left-2"
- Recommend - install under vented hood
- Check local codes for fire and sanitary regulations
- If the unit is connected directly to the outside flue, an CSA approved down draft diverter must be installed at the flue outlet of the oven
- Oven cannot be operated without fan in operation

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.

1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 22 Quantity: 2
Manufacturer: FRYER
Model: PITCO
Description: 35C+S

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐
Hot Water	½"	☐	3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural [X] LP ☐
Size: ½" ☐ ¾" [X] 1" ☐ 1 ¼" ☐
BTU: 90,000

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
(QUICK SHIP) Fryer, gas, floor model, 35-40 lb. oil capacity, millivolt control, stainless steel tank, door & front, 90,000 BTU, CSA Flame, CSA Star, NSF, CE 2 ea 1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard 1 ea Natural gas 2 ea Model P6072145 Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer 2 st Model B3901501 Casters, 6" swivel, (2) locking & (2) non-locking, for economy, food/fish, donut fryers, (set of 4) 2 ea Remagen Solutions Model FS-034-K1-48 EasyFlex 3/4" Gas Connection Kit, 48" Length

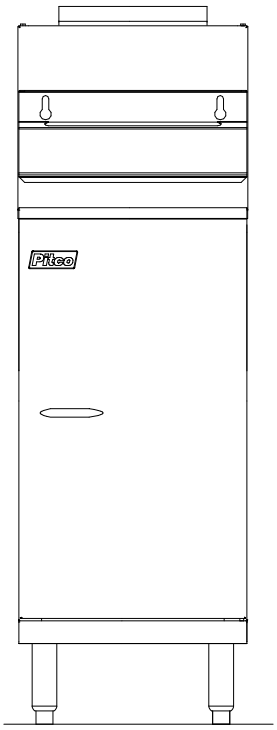
Reviewer's Stamp:

Model 35C+ & 45C+ Economy Tube Fired Gas Fryers

Project _____

Item No. _____

Quantity _____



STANDARD ACCESSORIES

- Cabinet - stainless steel front, door
- Galvanized sides and back
- Tank - stainless steel
- Built-in integrated flue deflector
- Two nickel plated oblong, wire mesh baskets
- One nickel-plated tube rack
- One drain extension
- One drain line clean-out rod
- Removable basket hanger for easy cleaning
- 6” (15.2 cm) adjustable legs

AVAILABLE OPTIONS & ACCESSORIES

- ☐ Triple baskets
- ☐ Covers
- ☐ Fryer cleaner
- ☐ Casters

STANDARD SPECIFICATIONS

CONSTRUCTION

- Welded tank with an extra smooth peened finish ensures easy cleaning.
- Long-lasting, high-temperature alloy stainless steel heat baffles are mounted in the heat exchanger tubes to provide maximum heating and combustion efficiency.
- Standing pilot light design provides a ready flame when heat is required.
- Cabinet front and door are constructed of stainless steel with galvanized sides and back.

CONTROLS

- Thermostat maintains selected temperature automatically between 200°F (93°C) and 400°F (190°C-CE).
- Integrated gas control valve acts as a manual and pilot valve, automatic pilot valve, gas filter, pressure regulator (MAX ½ PSI SUPPLY), and automatic main valve.
- Gas control valve prevents gas flow to the main burner until pilot is established and shuts off all gas flow automatically if the pilot flame goes out.
- Temperature limit switch safely shuts off all gas flow if the fryer temperature exceeds the upper limit.

OPERATIONS

- Front 1-1/4” (3.2 cm) NPT drain for quick draining.
- Standing pilot and thermostat maintain temperature automatically at the selected temperature (between 200°F (93°C) and 400°F (190°C-CE)).

Please note: 35C+ is only model “CE” approved

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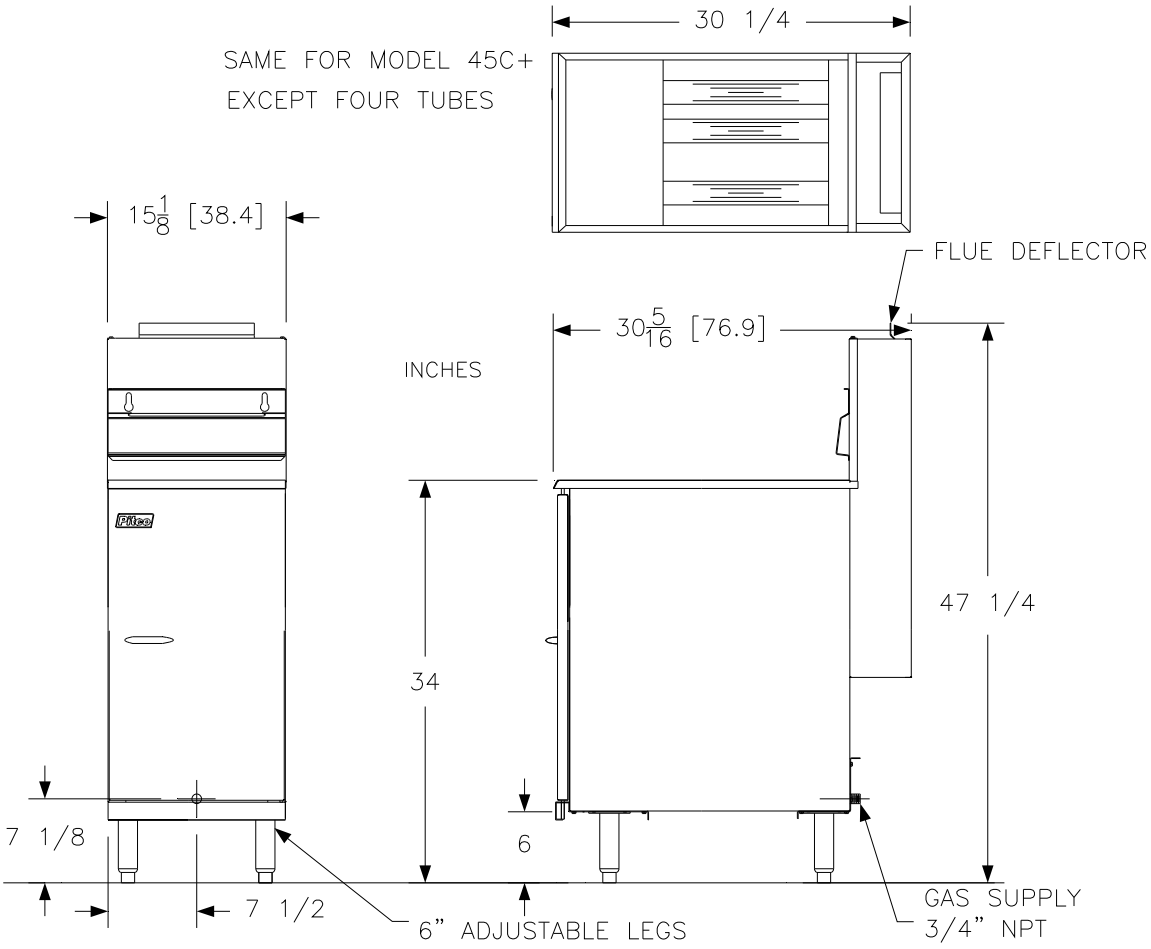
Pitco Frialator, Inc., P.O. Box 501, Concord, NH 03302-0501 • 553 Route 3A, Bow NH 03304, USA
(603) 225-6684 • Fax (603) 225-8472 • *www.pitco.com*

L10-144 Rev 15 (07/24)

Model 35C+ & 45C+ Economy Tube Fired Gas Fryers

Model 35C+ & 45C+ Economy Tube Fired Gas Fryers

Model 35C+ and 45C+ Gas Fired Fryers



ELECTRICAL	OIL CAPACITY
No Electrical options available	35-40 lbs (15.9 - 18.1 kg)- Model 35C+
	42-50 lbs (19.1 - 22.7 kg)- Model 45C+

SHIPPING INFORMATION (Approximate)
161 lbs (73 kg) / 17.0 cubic feet (0.48 cubic meters) Model 35C+
181 lbs (82 kg) / 17.0 cubic feet (0.48 cubic meters) Model 45C+

GAS CONSUMPTION	PERFORMANCE CHARACTERISTICS	
90,000 BTU's/Hour (26.3 kW) 122,000 BTU's/Hour (35.7 kW) Available in Natural or Propane Gas. For other Fuel types contact your Dealer/Distributor.	Cooks 50.2 lbs. (22.7 KG) of fries per hour.-Model 35C+ Cooks 66.2 lbs. (30.0 KG) of fries per hour.-Model 45C+	
Gas requirement for Incoming Pressure	NATURAL	PROPANE
	7 - 9 inches	11 - 12 inches

SHORT FORM SPECIFICATION

Provide Pitco 35C+, or 45C+ tube-fired gas fryer. Fryer shall have an atmospheric burner system combined with three stainless steel tubes (Model 45C+ has four tubes) utilizing high temperature alloy stainless steel baffles. Fryer shall have a deep cool zone; minimum 20% of total oil capacity. Fryer cooking area shall be 14" x 14" (35.7 x 35.7 cm) with a cooking depth of 2-3/4" (7.00 cm). Model 45C+ has cooking depth of 4" (10.16 cm). Heat transfer area shall be a minimum of 588 square inches (3794 sq cm) for 35C+. Heat transfer area shall be a minimum of 785 square inches (5058 sq cm) for 45C+. Provide accessories as follows:

TYPICAL APPLICATION

Frying a wide variety of foods in a limited amount of space. Frying that requires a high volume production rate.

Pitco Frialator, Inc., P.O. Box 501, Concord, NH 03302-0501 • 553 Route 3A, Bow NH 03304, USA
Phone • (603) 225-6684 • Fax (603) 225-8472 • *www.pitco.com* L10-144 Rev 15 (07/24) Printed in the USA

We reserve the right to change specifications without notice and without incurring any obligation for equipment previously or subsequently sold.

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 23 Quantity: 1
Manufacturer: EVEREST
Model: ECB82-84D4
Description: REFRIGERATED EQUIP STAND

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 2 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3		X	
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½”		¾”	
Hot Water	½”		3/4”	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½” [ ] ¾” [ ] 1” [ ] 1 ¼” [ ]
BTU: _____

Steam Requirements:

Supply:	½”		1”	
Return:	½”		1”	

Description / Accessories:
Chef Base Refrigerator, two-section, 84"W, self-contained side mounted refrigeration, (4) heavy duty stainless steel drawers, 1,084 lbs. weight capacity, 16 gauge stainless steel worktop, digital controls with LED display, auto defrost, dual air chamber & vents, high heat insulation, stainless steel grips, worktop security corner guards, stainless steel interior & exterior, galvanized steel bottom & rear, (3) leg stabilizers, (6) 5" swivel casters (3 locking), R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1-ph, 2.0 amps, cord, NEMA 5-15P, NSF, cETLus, ETL-Sanitation 1 ea Parts and labor: 3 years from ship date 1 ea Electrical components: 5 years from ship date 1 ea Compressor: 10 years from ship date 1 ea Model CASA5-02 5" Overall Height Casters Set of 6, (front 3 locking), standard

Reviewer’s Stamp:

CHEF BASE (FOUR DRAWER)

Side Mounted Condensing Unit

www.EVERESTref.com

Project Name: _____

Project Location: _____

Model #: _____ Quantity: _____

Available Warehouse: _____

ECB Series Model: ECB82-84D4



Refrigeration System

· Side mounted, self-contained and fully detachable Blizzard R290 condensing unit uses environmentally friendly, EPA-compliant R290 refrigerant with zero (0) Ozone Depletion Potential (ODP) and three (3) Global Warming Potential (GWP). Blizzard R290 is easily replaceable and requires no on-site brazing.
· Electronically commutated (ECM) fan motors achieve rapid cooling with less energy consumption.
· Full-length air duct system ensures optimal circulation of cold air.
· Time-initiated and temperature-terminated auto defrost cycle for seamless operation.
· Large capacity, corrosion-resistant condenser and evaporator coils.
· Self-maintaining, energy-efficient condensate drain pan requires no external drains or electric heaters.
· High performance, auto-reverse condenser fan motor supports compressor ventilation and condenser coil cleaning. Refer to owner's manual for full maintenance instructions.
· Pressure relief devices allow smooth access to cabinet interior when re-opening drawers.
· Pre-wired and ready to plug, 115V/60Hz/1Ph, NEMA 5-15P.

Cabinet Construction

· Heavy duty stainless steel interior / exterior with rounded corners for a hazard-free workspace.
· Galvanized steel bottom and rear.
· 2.5" thick high density polyurethane insulation.
· 16-gauge stainless steel worktop is built with unique air chamber and vents that channel heat produced by mounted cooking equipment away from the unit. Additional layer of high grade insulation material withstands extreme heat. These features prevent the worktop from heat-induced warping, keep the cabinet cold and reduce overall energy costs.
· Thick gauge stainless steel corner guards keep mounted cooking equipment from sliding off the worktop.
· Heavy duty stainless steel grips provide secure maneuverability for the unit.
· 12-gauge metal caster brackets support additional weight of mounted cooking equipment.
· Six 5" swivel casters with locks on front set and three front leg stabilizers.

Recommended Operating Conditions

· A minimum clearance of 6" is required between the cooking equipment's heating element and the Chef Base worktop.

Drawers

· Heavy duty stainless steel interior / exterior.
· 2.5" thick high density polyurethane insulation.
· Thick gauge, stainless steel drawer frames with low-friction ball bearings.
· Snap-in, heat resistant, magnetic drawer gaskets make cleaning and replacement an easy process.
· High strength, recessed drawer handles.
· NSF certified polycarbonate 4" deep pans (refer to the website for pan configurations).

Temperature Control

· Multi-function digital controller with easy to read LED display.
· Factory preset temperature, 35°F. Temperature setting range from 33°F to 54°F.
· Audible overheat protection alarm for compressor and condenser coil.

Options

· 3" swivel casters with locks.
· 3.5" – 6" height-adjustable and interchangeable legs.

Operating temperature range is 33ºF ~ 54ºF

5 YEAR Compressor
3 YEAR Parts & Labor

Please visit our website for updated Energy Efficiency information

Ref/ Frz/Dual	Drawers	Max Weight Support (LBS)	# of Pans	Refrigerant	HP	Power V-Hz-Ph	Amps	Crated Weight	Exterior Dimensions		
									L	D	H*
REF	4	1084	1x10	R-290	1/3	115-60-1	2.5	489 lbs (222kg)	84" (2134mm)	32.125" (816mm)	20" (508mm)

(†)Based on evaporating temperature of 23ºF (-5ºC) & condensing temperature of 131ºF (55ºC). (⚑) Product capacity is calculated based on standard industry figures. (⁎) Reference plan view for clarification on caster/unit height. If dimensions and capacity are critical, please contact Everest Refrigeration. Blizzard R290 replacement is at the sole discretion of Everest Refrigeration. Specifications subject to change without notice.

CHEF BASE (FOUR DRAWER)

Side Mounted Condensing Unit

www.EVERESTref.com

ECB Series Model: ECB82-84D4

DIMENSIONAL DATA

External Dimensions	L	84" (2134mm)
	D	32.125" (816mm)
	H*	20" (508mm)
Crated Weight		489 lbs. (222kg)
Doors/Drawers/Lids		4
Max Weight Support (LBS)		1084

STORAGE DATA

Net Capacity Cu. Ft. ⚑	
Shelves	-
Barrels	-
20 oz. Bottles	-
12 oz. Bottles	-
12 oz. Cans	-
8" Mugs	-
# of Pans (Top)	-
# of Pans (Drawer)	1x10
Dividers	-
Trays	-

ELECTRICAL DATA

Voltage	115-60-1
Full Load Amperage	2.5
Feed Wires with Ground	3
Cord Length	9ft
NEMA Plug Type	NEMA 5-15P

REFRIGERATION DATA

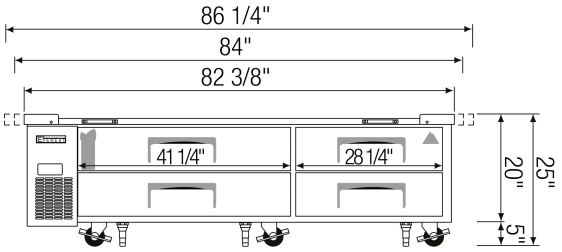
Compressor Mounting	Side
Refrigerant	R-290
Compressor HP	1/3
BTU/HR †	2311

KEY

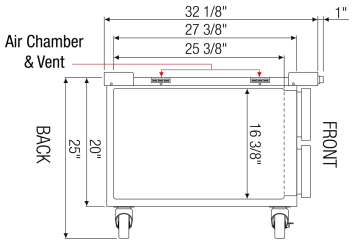
R	Refrigerator	**D**	Door
REF	Refrigerator	**L**	Lid
F	Freezer	**H**	Half Door
FRZ	Freezer	**FD**	Full Door
DUAL	REF/FRZ Combo	**SD**	Solid Door
DR	Drawer	**GD**	Glass Door

	Elevation	Right	Plan	3D	Back
KCL					

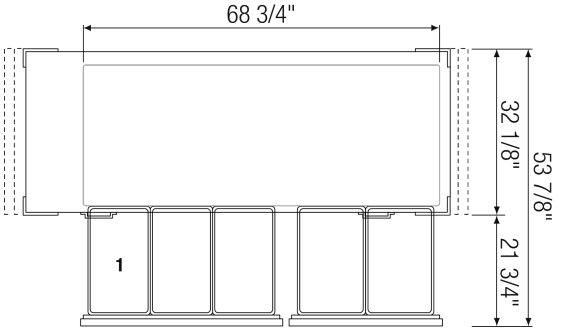
PLAN VIEW



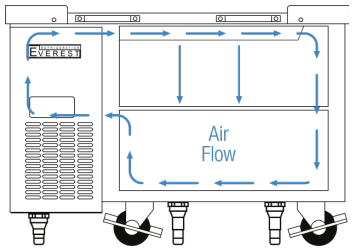
FRONT



SIDE



TOP



AIRFLOW

ACCESSORIES & OPTIONS

Part Number	Description
AJL03-00	Interchangeable Leg for Caster
CASA3-02	3" Overall Height Caster Assembly - (3) Front (3) Rear

(†)Based on evaporating temperature of 23ºF (-5ºC) & condensing temperature of 131ºF (55ºC). (⚑) Product capacity is calculated based on standard industry figures. (∗) Reference plan view for clarification on caster/unit height. If dimensions and capacity are critical, please contact Everest Refrigeration. Blizzard R290 replacement is at the sole discretion of Everest Refrigeration. Specifications subject to change without notice.

201 W. Artesia Blvd., Compton, CA 90220 T. (310) 323-6586 F. (310) 323-7524

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 24 Quantity: 1
Manufacturer: SOUTHBEND
Model: HDO-36
Description: HOTPLATE

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½”	☐	¾”	☐
Hot Water	½”	☐	3/4”	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural [X] LP ☐
Size: ½” ☐ ¾” [X] 1” ☐ 1 ¼” ☐
BTU: 198,000

Steam Requirements:

Supply:	½”	☐	1”	☐
Return:	½”	☐	1”	☐

Description / Accessories:
Hotplate, gas, countertop, 36", (6) 33,000 BTU open burners, manual controls, removable cast iron grates & crumb tray, stainless steel front, sides & 4" adjustable legs, 198,000 BTU, CSA, NSF 1 ea Domestic Shipping, inside of North America 1 ea Standard one year limited warranty 1 ea Natural Gas 2 ea Remagen Solutions Model FS-034-K1-48 EasyFlex 3/4" Gas Connection Kit, 48" Length

Reviewer’s Stamp:

COUNTERTOP RANGE

GAS MODULAR COUNTERTOP RANGES



Model HDO-36SU

- ❑ HDO-12
- ❑ HDO-24
- ❑ HDO-36
- ❑ HDO-48

Step-up Models:

- ❑ HDO-24SU
- ❑ HDO-36SU
- ❑ HDO-48SU

Standard Features

- Available in 12”, 24”, 36” and 48” (24”, 36” and 48” step-up units also available)
- 33,000 BTU NAT (24,000 BTU LP) open top non-clogging burner
- Hi/Low burner controls
- Stainless steel front and sides
- 3/4” rear gas connection and pressure regulator
- 12” cast flush top grates
- 4” stainless steel legs
- Stainless steel, full width crumb tray
- One year limited Parts and Labor Warranty

OPTIONS & ACCESSORIES AT ADDITIONAL COST

- ❑ Stainless steel stand
- ❑ Casters for stand
- ❑ High performance WOK ring
- ❑ 2” high insulator base for mounting on refrigerated base
- ❑ Battery spark ignition

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Stainless steel front and sides. Rear and bottom panels are constructed of aluminized steel.

Range Top: Each burner is a 33,000 BTU NAT (24,000 BTU LP) cast iron non-clogging burner (available in step-up). Removable flush top grates. Center-to-center measurements between burners not less than 12”, side-to-side or front-to-back. Removable one piece, full width crumb tray provided under burners.

Gas Heat Control System: Each burner is controlled by a gas valve for independent control of flame. One standing pilot services each burner. A 3/4” rear gas connection is standard.

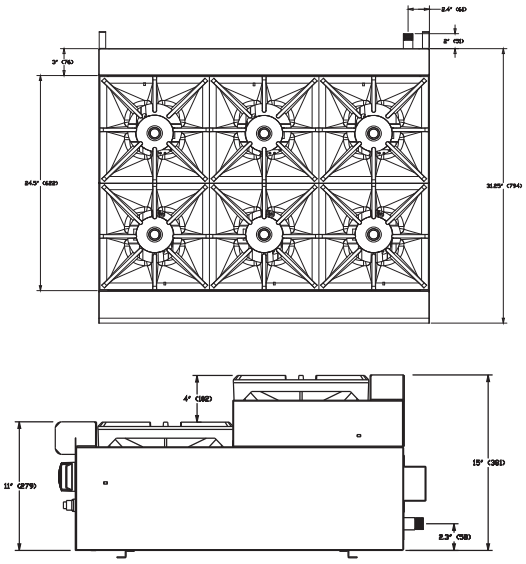
Legs: Stainless steel 4” adjustable legs.

Approval Notes: _____

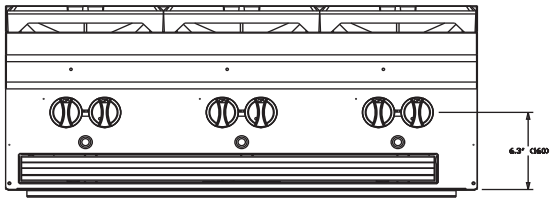
1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

Models: ☐ **HDO-12** ☐ **HDO-24** ☐ **HDO-36** ☐ **HDO-48** ☐ **HDO-24SU** ☐ **HDO-36SU** ☐ **HDO-48SU**

HDO



Dimensions shown in inches and (millimeters)



DIMENSIONS

Shipping Crate Dimensions & Weight											
Model	Width	Number of Burners	Crated Width	Crated Depth	Crated Weight	Model	Width	Number of Burners	Crated Width	Crated Depth	Crated Weight
HDO-12	12.125" (308)	2(33K/24K)	31" (788)	39" (991)	165 lbs (75 kg)	HDO-36/36SU	36.75" (933)	6(33K/24K)	55" (1398)	39" (991)	253 lbs (115 kg)
HDO-24/24SU	24.5" (622)	4(33K/24K)	31" (788)	39" (991)	209 lbs (94 kg)	HDO-48/48SU	49" (1245)	8(33K/24K)	55" (1398)	39" (991)	299 lbs (135 kg)

Dimensions shown in inches and (millimeters)

UTILITY INFORMATION

GAS: Each unit has a 3/4" rear gas connection with a male NPT connector(female when regulator is added). Minimum supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All units require a regulated gas supply. pressure regulator included. If using a flexible hose gas connection, the I.D. of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

Model	Gas (BTU/hr)	
	Natural	Propane
HDO-12	66,000	48,000
HDO-24/24SU	132,000	96,000
HDO-36/36SU	198,000	144,000
HDO-48/48SU	264,000	192,000

MISCELLANEOUS

- If casters are used with flex hose, a restraining device should be used to eliminate undue stain on the flex hose.
- Minimum clearance from noncombustible construction is zero. Minimum clearance from combustible construction is 10" on sides and 6" on rear.
- Install under vented hood.
- Check local codes for fire and sanitary regulations.

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

DISCLAIMER

1. **Oversized Cookware Use Policy** – "Oversized cookware is considered anything 12" in diameter or larger. Larger vessels may be used to straddle over open top grates (although efficiency may be lost when doing so). It is highly recommended when using oversized cookware that its use be limited to the rear portion of the range. IF oversized cookware is used on the front potion and hangs over onto the front rail, excessive heat may be driven and trapped in the front rail and can cause premature damage to the components housed there. This is easily avoided by never allowing cookware to overlap the front rail of the range. Electrical and other components housed in this area should see years of performance under normal intended use."

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NOT FOR HOUSEHOLD USE.

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(919) 762-1000 www.southbendnc.com

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 25 Quantity: 1
Manufacturer: SOUTHBEND
Model: HDG-36
Description: GRIDDLE

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural [X] LP ☐
Size: ½" ☐ ¾" [X] 1" ☐ 1 ¼" ☐
BTU: 90,000

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
(QUICK SHIP) Griddle, countertop, gas, 36" W x 24" D cooking surface, 1" thick polished steel plate, thermostatic controls, battery spark ignition, flame failure safety device, stainless steel front, sides & 4" adjustable legs, 90,000 BTU, CSA, NSF (Ships within 2 days, maximum quantity = 2 per order) 1 ea Quick Ship items have limited configurations & that standard configuration may not apply. Contact factory for details 1 ea Domestic Shipping, inside of North America 1 ea Standard one year limited warranty 1 ea Natural Gas 2 ea Remagen Solutions Model FS-034-K1-48 EasyFlex 3/4" Gas Connection Kit, 48" Length

Reviewer's Stamp:

COUNTERLINE - GRIDDLE

HEAVY DUTY, THERMOSTATIC and MANUAL, GAS



Model shown Model HDG-24

Thermostatic Griddles:

- ❑ HDG-18
- ❑ HDG-24
- ❑ HDG-36
- ❑ HDG-48
- ❑ HDG-60
- ❑ HDG-72

Manual Griddles:

- ❑ HDG-18-M
- ❑ HDG-24-M
- ❑ HDG-36-M,
- ❑ HDG-48-M
- ❑ HDG-60-M,
- ❑ HDG-72-M

Standard Features

- Available in 18”, 24”, 36”, 48”, 60” and 72” widths
- 30,000 BTU (NAT or LP) burner per 12” Thermostatic Models
- 20,000 BTU (NAT or LP) burner per 12” Manual Models
- Electronic spark ignition (battery)
- Stainless steel front, vent and sides are standard, rear and bottom panels are aluminized steel.
- Reinforced, insulated double wall sides
- 1” thick polished rolled steel plate
- 5” high rear and 4” side splash guards
- 3/4” rear gas connection and pressure regulator
- Protected flue opening
- Exclusive “NO COLD” Zone -Uniform heat distribution across surface
- Each burner equipped with runner tube
- Grease drawers with large capacity
- Fully welded griddle plate with protected exhaust vent

Standard Features of Thermostatic Griddle Models

- “Insta-on” thermostatic controls for precise settings between 200°F and 550°F
- Imbedded load sensing thermostat
- Flame failure safety device

OPTIONS & ACCESSORIES AT ADDITIONAL COST

- ❑ Stainless steel stand
- ❑ Stainless steel plate shelf with or without cutting board
- ❑ Casters for stand
- ❑ Grooved griddle plates
- ❑ Chrome plated griddle plates
- ❑ 2” high insulator base for mounting on refrigerated base

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Front, sides and vent are constructed of #3 polished 430 and 304 stainless steel. Bottom and rear are aluminized steel. Sides are reinforced and fully insulated. 5” rear and 4” side splash.

Griddle Plate: 18”, 24”, 36”, 48”, 60”, 72” wide unit with one 30,000 BTU (NAT or LP) burners every 12” on thermostatic models and one 20,000 BTU (NAT or LP) burners every 12” on manual models. Fully welded, 1” thick polished steel griddle plate with side splash guards, and grease drawer.

Griddle Controls: Independent, “Insta-on” thermostatic controls with uniform temperature range of 200°F to 550°F. (Thermostatic models ONLY)

Legs: Stainless steel 4” adjustable legs.

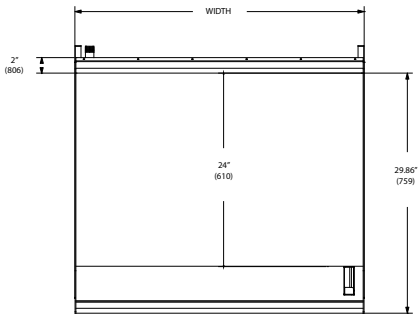
Gas Heat Control System: Each foot of griddle is heated by a “U” shaped burner. Each burner is controlled by a thermostatic control. For safety, each pilot has a flame failure device. A 3/4” rear gas connection is standard. Units over 48” wide are constructed of two bodies. (Thermostatic models ONLY)

Approval Notes: _____

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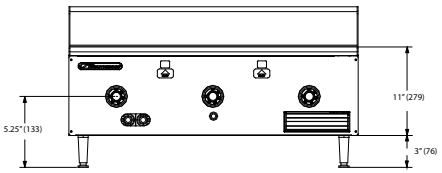
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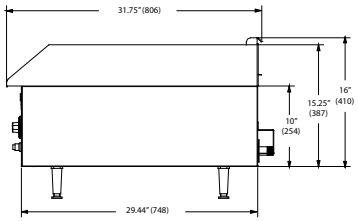
Models: ☐ HDG-18 ☐ HDG-24 ☐ HDG-36 ☐ HDG-48 ☐ HDG-60 ☐ HDG-72
☐ HDG-18-M ☐ HDG-24-M ☐ HDG-36-M ☐ HDG-48-M ☐ HDG-60-M ☐ HDG-72-M



Dimensions shown in inches and (millimeters)

(Model shown with thermostatic controls)





DIMENSIONS

Shipping Crate Dimensions & Weight											
Model	Width	Number of Burners	Crated Width	Crated Depth	Crated Weight	Model	Width	Number of Burners	Crated Width	Crated Depth	Crated Weight
HDG-18/ HDG-18-M	18" (457)	1	31" (788)	39" (991)	270 lbs (122 kg)	HDG-48/ HDG-48-M	48" (1220)	4	55" (1398)	39" (991)	545 lbs (247 kg)
HDG-24/ HDG-24-M	24" (610)	2	31" (788)	39" (991)	305 lbs (159 kg)	HDG-60/ HDG-60-M	60" (1525)	5	67" (1703)	45.5" (1157)	705 lbs (320 kg)
HDG-36/ HDG-36-M	36" (915)	3	55" (1398)	39" (991)	445 lbs (202 kg)	HDG-72/ HDG-72-M	72" (1830)	6	110" (2796)	45.5" (1157)	840 lbs (378 kg)

Dimensions shown in inches and (millimeters)

UTILITY INFORMATION

GAS: Each unit has a 3/4" rear gas connection with a male NPT connector(female when regulator is added). Minimum supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All units require a regulated gas supply. pressure regulator included. If using a flexible hose gas connection, the I.D. of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

Model	Gas (BTU/hr)		Model	Gas (BTU/hr)	
	Natural	Propane		Natural	Propane
HDG-18/ HDG-18-M	30,000	30,000	HDG-48/ HDG-48-M	120,000	120,000
	20,000	20,000		80.000	80,000
HDG-24/ HDG-24-M	60,000	60,000	HDG-60/ HDG-60-M	150,000	150,000
	40,000	40,000		100,000	100,000
HDG-36/ HDG-36-M	90,000	90,000	HDG-72/ HDG-72-M	180,000	180,000
	60,000	60,000		120,000	120,000

MISCELLANEOUS

- If casters are used with flex hose, a restraining device should be used to eliminate undue stain on the flex hose.
- Minimum clearance from noncombustible construction is zero. Minimum clearance from combustible construction is 12" on sides and 8" on rear.
- Install under vented hood.
- Check local codes for fire and sanitary regulations.

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

DISCLAIMER

1. **Oversized Cookware Use Policy** – "Oversized cookware is considered anything 12" in diameter or larger. Larger vessels may be used to straddle over open top grates (although efficiency may be lost when doing so). It is highly recommended when using oversized cookware that its use be limited to the rear portion of the range. IF oversized cookware is used on the front potion and hangs over onto the front rail, excessive heat may be driven and trapped in the front rail and can cause premature damage to the components housed there. This is easily avoided by never allowing cookware to overlap the front rail of the range. Electrical and other components housed in this area should see years of performance under normal intended use."

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Printed in USA Date:_____

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 26-29 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:

Reviewer's Stamp:

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Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 30 Quantity: 1
Manufacturer: COZOC
Model: HPC7101-C9F9
Description: HEATED HOLDING CABINET

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 12.5 KW: 1.5
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:

Reviewer's Stamp:

Specification

HPC7101-C9F9 Insulated Universal



- Designed for proofing and heating.
- All digital display and controls.
- Machined Zinc Alloy handle.
- Adjustable thermostat for a variety of warming temperatures.
- Holding temperature up to 185 F.
- Water pan provides moisture for proofing.
- Humidity up to 95% (under 90F).
- Universal Rack System can hold both full size sheet pans (18"X26") as well as hotel steam pans.
- Clear polycarbonate door for viewing.
- High quality 5" casters, two with safety-lock.
- Aluminum cabinet

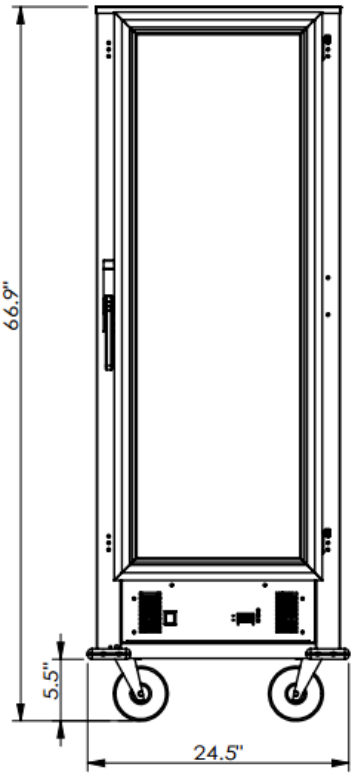
Note: Dimensions and Specification are subject to change without notice.

This full-size Insulated cabinet, offers an Universal Rack System, allows the option to adjust the racks to fit your specific needs. It can hold a wide assortment of pan sizes including up to a 18" pizza box. Offering the ability to proof a variety of baked goods, allowing dough to rise before baking. All digital temperature controls with easy set up. Enables a variety of temperatures, including warming. Designed with enduring quality in mind.

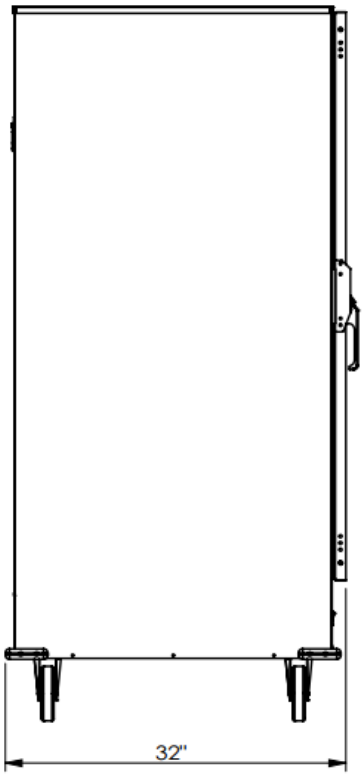
Dimensions and Specifications

HPC7101-C9F9

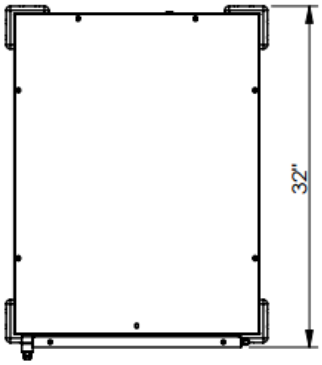
Front View



Side View



Top View



Pan Capacity	Universal Rack System 16 story,18" x 26", 12"X20", 16" x 20", 13"X18", 14"X18" Holds up to 18" Pizza Box Accommodates hotel pans
Options	
Electrical	120 Volts
Power	1500 Watts
Net Weight	211 lbs.
Gross shipping weight	243 lbs.
Class	100
Dimensions	24.5" W x 32" D x 66.9" H
Package	24" W x 33" D x 67" H
Warranty	1 Year Manufactures limited Warranty

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 31 Quantity: 4
Manufacturer: RUBBERMAID
Model: FG354060BLA
Description: TRASH RECEPTACLE

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, black, Made in USA 5 ea Model FG267360BLA Slim Jim® Swing Lid, for Slim Jim® Container, black, Made in USA (contact Rubbermaid for broken case information) 5 ea Model 1968468 Slim Jim® Dolly, single, 20"L x 9-3/10"W x 9"H, 100 lb. capacity, stainless steel, (4) 3" casters

Reviewer's Stamp:

Slim Jim® Container

Combine efficiency and ease of handling with the 23 gallon Rubbermaid Slim Jim® Container, now available with optional handles. Positioned high on the container, the large handles are easy to grasp and help give improved leverage and control for lifting and emptying. For smaller volume requirements or where full container lifting weight is a concern, choose the 15.9 gallon Slim Jim® Container. Interchangeable, color-coded Recycling Tops fit both container sizes and help encourage effective waste separation. An innovative linking trolley system can be used to transport multiple Slim Jim® containers in one trip or individually as a dolly.

Make your operation productive and efficient with the Slim Jim® Containers,Tops and Trolley System– the strongest link in your waste separation program!



Containers come in two capacities for versatility to fit your needs.



Linking trolleys detach easily by pushing front toeplate.

Color-coded tops encourage effective separation of recyclable waste: blue top with slot for paper, green and brown tops with holes for bottles and cans, gray and yellow tops for general refuse.

Large handles positioned high on the Slim Jim® container give leverage and control.

Durable, lightweight plastic construction provides long life without the weight, sharp edges and rusting common with some metal containers.



Slim Jim® Container

Item No.	Description	Dimensions	Capacity	Polyliner Bags	Color	Pack
3540	Slim Jim® Container	20" l x 11" w x 30" h (50.8 cm x 27.9 cm x 76.2 cm)	23 U.S. gal. (87.1 L)	5009-88, 5074, 5084	Light Gray, Dark Blue, Brown, Beige	4
3541	Slim Jim® Container with Handles	23 1/8" l x 11" w x 24 7/8" h (58.7 cm x 27.9 cm x 63.2 cm)	15 7/8 U.S. gal. (60 L)	5009-88, 5074, 5084	Light Gray, Dark Blue, Beige	4
3554	Slim Jim® Container with Handles	20" l x 11" w x 30" h (50.8 cm x 27.9 cm x 76.2 cm)	23 U.S. gal. (87.1 L)	5009-88, 5074, 5084	Light Gray, Dark Blue, Brown, Beige	4
2673	Slim Jim® Untouchable® Top fits 3540, 3541, 3554 Containers	20 3/8" l x 11 3/8" w x 4 3/4" h (51.8 cm x 28.9 cm x 12.1 cm)			Dark Blue, Brown, Light Gray	4
2688-88	Slim Jim® Handle Top fits 3540, 3541, 3554 Containers	20 3/8" l x 11 5/16" w x 2 3/4" h (51.8 cm x 28.7 cm x 7 cm)			Light Gray, Yellow	4
2692-88	Slim Jim® Bottle & Can Recycling Top fits 3540, 3541, 3554 Containers	20 3/8" l x 11 5/16" w x 2 3/4" h (51.8 cm x 28.7 cm x 7 cm)			Brown, Green	4
2703-88	Slim Jim® Paper Recycling Top fits 3540, 3541, 3554 Containers	20 3/8" l x 11 5/16" w x 2 3/4" h (51.8 cm x 28.7 cm x 7 cm)			Dark Blue	4
3551	Slim Jim® Trolley accommodates 3540, 3541, 3554 Containers	23 7/16" l x 15" w x 10 13/16" h (59.5 cm x 38.1 cm x 27.5 cm)			Gray	2

Products manufactured under a quality management system registered to ISO 9002.

www.rubbermaid.com/rcp

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Winchester, VA 22601
Printed in U.S.A. 2/00-50M Litho SM-548

Rubbermaid®
Commercial Products

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 32 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: 7-PS-20
Description: HAND SINK

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	X	¾"	☐	
Hot Water	½"	☐	X	3/4"	☐	

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ X Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐		
Return:	½"	☐	1"	☐		

Description / Accessories:
Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with heavy duty deck mounted fixed faucet, basket drain, NSF, cCSAus

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

STANDARD HAND SINKS

Conforms To NSF 61/9 Lead Free Requirements

SPLASH MOUNTED FAUCETS



7-PS-60

Wrist Handles



7-PS-68



7-PS-50



7-PS-54

DECK MOUNTED FAUCET



7-PS-67



7-PS-20



7-PS-20-NF
Faucet omitted

SINGLE HOLE PUNCH
Faucet omitted



7-PS-71

DOUBLE HOLE PUNCH
Faucet omitted



7-PS-70

LARGE SINK BOWLS

Features Large Size Sink Bowl 16” x 20” x 8”



7-PS-45

Features Large Size Sink Bowl 16” x 14” x 8”



7-PS-49

Item #: _____ **Qty #:** _____

Model #: _____

Project #: _____

FEATURES:

One piece **Deep Drawn** sink bowl design.

Sink bowl size is 10” x 14” x 5”.

7-PS-45 sink bowl size is 16” x 20” x 8”.

7-PS-49 sink bowl size is 16” x 14” x 8”.

All sink bowls have a large liberal radii with a minimum dimension of 2” and are rectangular in design for increased capacity.

Stainless steel 3 1/2” basket drain with 1-1/2” IPS.

Additional Features:

7-PS-20	K-22 4” O.C. deck mounted centerset faucet.
7-PS-20-NF	Deck mounted faucet omitted. Two 4” O.C. holes.
7-PS-45	K-59 4” O.C. splash mounted faucet and 2 Stainless Steel Support Brackets. (Hardware Included).
7-PS-49	K-59 4” O.C. splash mounted faucet and 2 Stainless Steel Support Brackets. (Hardware Included).
7-PS-50	K-59 4” O.C. splash mounted gooseneck faucet. Lever operated drain and built-in overflow with plastic overflow tube and spring clamps. 1-1/2” P-Trap.
7-PS-54	K-59 4” O.C. splash mounted gooseneck faucet. 1-1/2” P-Trap.
7-PS-60	K-59 4” O.C. splash mounted gooseneck faucet.
7-PS-67	K-59 4” O.C. splash mounted gooseneck faucet and lever operated drain.
7-PS-68	K-59 4” O.C. splash mounted gooseneck faucet with Wrist Handles.
7-PS-70	Splash mounted faucet omitted. Two 4” O.C. holes.
7-PS-71	Splash mounted faucet omitted. Single center hole.

CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Die formed Countertop Edge with a No-Drip offset.

One sheet of stainless steel - No Seams.

MATERIAL:

Heavy gauge type 304 series stainless steel.

Wall mounting bracket is Galvanized and of offset design.

All fittings are brass / chrome plated unless otherwise indicated.

MECHANICAL:

Faucet supply is 1/2” IPS male thread hot and cold.

Faucet Flow Rate: 1.0 GPM/3.8 LPM aerator. 60 PSI.

⚠ WARNING:

Equipment that includes a faucet may expose you to chemicals, including lead, that are known to the State of California to cause cancer or birth defects or other reproductive harm. For more Info.,visit www.p65warnings.ca.gov.

ADVANCE TABCO
SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

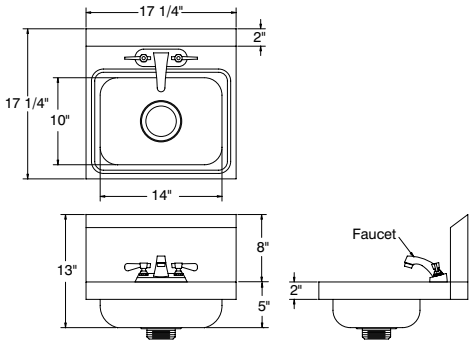
For Orders & Customer Service:
Email: customer@advancetabco.com or Fax: 631-242-6900

For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or Fax: 631-586-2933

DIMENSIONS and SPECIFICATIONS

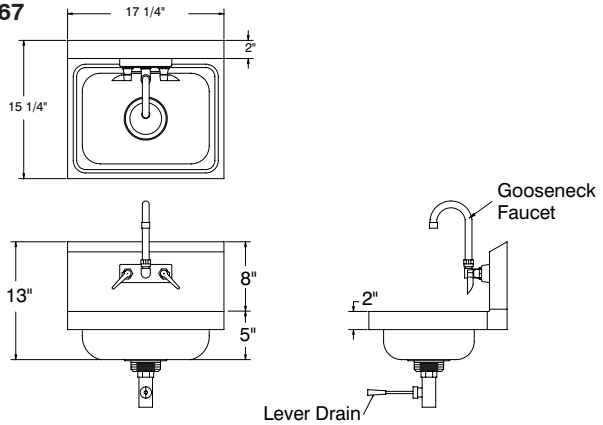
TOL Overall: ± .500" Interior: ± .250" **FITTINGS SUPPLIED AS SHOWN** **ALL DIMENSIONS ARE TYPICAL**

7-PS-20



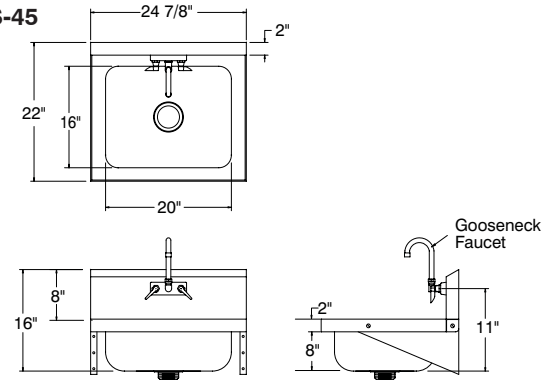
15 lbs.

7-PS-67



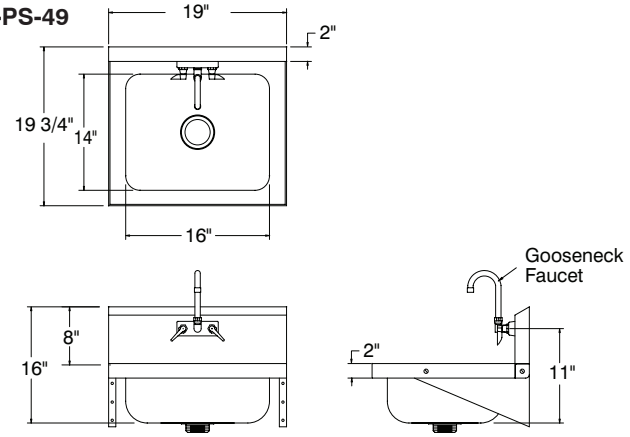
15 lbs.

7-PS-45



31 lbs.

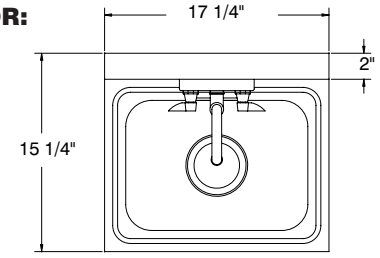
7-PS-49



31 lbs.

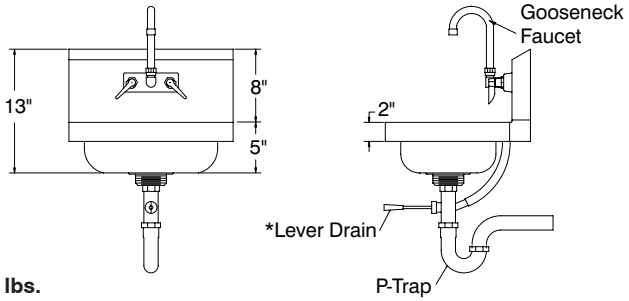
TOP VIEW FOR:

7-PS-50
7-PS-54
7-PS-60
7-PS-68
7-PS-70



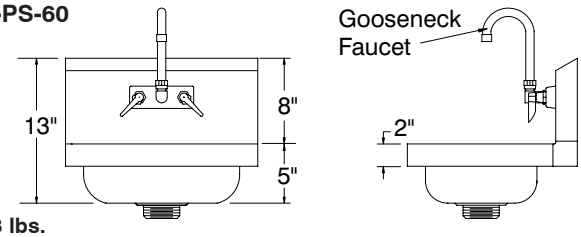
Sink Bowl 10" x 14" x 5"

7-PS-50 & 7-PS-54*
NOTE: *7-PS-54 Hand Sink <u>Excludes</u> Lever Drain and Overflow



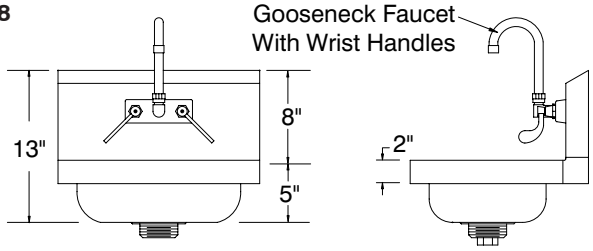
15 lbs.

7-PS-60



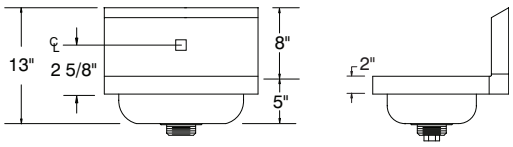
13 lbs.

7-PS-68

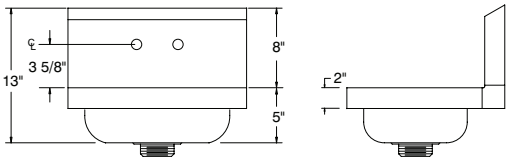


13 lbs.

7-PS-71



7-PS-70



12 lbs.

ADVANCE TABCO
SMART FABRICATION™

325 Wireless Boulevard, Hauppauge, NY 11788

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, MARCH 2024

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 33 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 34 Quantity: 1
Manufacturer: EVEREST
Model: ESR2
Description: REACH-IN REFRIGERATOR

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 3.8 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼	X	1/3	
½		¾		1	
1 ¼		1 ½		1 ¾	
2		2 ½		3	

Plumbing Requirements:

Cold Water	½”		¾”	
Hot Water	½”		3/4”	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½” [ ] ¾” [ ] 1” [ ] 1 ¼” [ ]
BTU: _____

Steam Requirements:

Supply:	½”		1”	
Return:	½”		1”	

Description / Accessories:
Reach-In Refrigerator, two-section, 49-5/8"W, 48.0 cu. ft. capacity, self-contained top mounted refrigeration, (2) solid hinged self-closing field reversible doors (locking), (6) epoxy coated wire shelves, height adjustable clips, digital controls with LED display, auto defrost, LED interior lighting, pressure relief port, stainless steel interior, stainless steel sides, galvanized steel top, bottom & rear, (4) 5" swivel casters (2 locking), R290 Hydrocarbon refrigerant, 1/4 HP, 115v/60/1-ph, 3.8 amps, cord, NEMA 5-15P, NSF, cETLus, ETL-Sanitation, ENERGY STAR® 1 ea Parts and labor: 3 years from ship date 1 ea Electrical components: 5 years from ship date 1 ea Compressor: 10 years from ship date 1 ea Door hinged on right & left, standard 1 ea Model CASA5-01 5" Overall Height Casters Set of 4, (front 2 locking), standard

Reviewer’s Stamp:

UPRIGHT REACH-IN REFRIGERATOR
TOP MOUNT CONDENSING UNIT

www.EVERESTref.com

Project Name: _____

Project Location: _____

Model #: _____ Quantity: _____

Available Warehouse: _____

ES Series Model: ESR2



Operating temperature range is 33ºF ~ 54ºF

5 YEAR Compressor
3 YEAR Parts & Labor

Please visit our website for updated Energy Efficiency information

Refrigeration System

· Top mounted, self-contained and fully detachable Blizzard R290 condensing unit uses environmentally friendly, EPA-compliant R290 refrigerant with zero (0) Ozone Depletion Potential (ODP) and three (3) Global Warming Potential (GWP). Blizzard R290 is easily replaceable and requires no on-site brazing.
· Electronically commutated (ECM) fan motors achieve rapid cooling with less energy consumption.
· Full-length air duct system and airflow guard ensure optimal circulation of cold air.
· Time-initiated and temperature-terminated auto defrost cycle for seamless operation.
· Large capacity, corrosion-resistant condenser and evaporator coils.
· Self-maintaining, energy-efficient condensate drain pan requires no external drains or electric heaters.
· High performance, auto-reverse condenser fan motor supports compressor ventilation and condenser coil cleaning. Refer to owner's manual for full maintenance instructions.
· Pressure relief devices allow smooth access to cabinet interior when reopening doors.
· Pre-wired and ready to plug, 115V/60Hz/1Ph, NEMA 5-15P.

Cabinet Construction

· Heavy duty stainless steel interior / exterior with rounded corners for a hazard-free workspace.
· Open spaced interior with no walls between compartments.
· Galvanized steel top, bottom and rear.
· 2.5" thick high density polyurethane insulation.
· Four 5" swivel casters with locks on front set.

Lighting

· Energy efficient silicone coated and shatter-proof LED lighting provides bright, high color illumination with low heat output.

Doors

· Heavy duty stainless steel interior / exterior.
· 2.5" thick high density polyurethane insulation.
· Frame heaters prevent exterior moisture build up.
· Self-closing with adjustable torsion system for a positive seal.
· Snap-in magnetic door gasket make cleaning and replacement an easy process.
· High strength, recessed door handles.
· Pre-installed door locks keep your items safe from theft.
· Field reversible.

Shelving

· Three epoxy coated, steel wire shelves per section.
· Height adjustable stainless steel clips.

Temperature Control

· Multi-function digital controller with easy to read LED display.
· Factory preset temperature, 35°F. Temperature setting range from 33°F to 54°F.
· Audible overheat protection alarm for compressor and condenser coil.

Options

· Additional shelving.
· 3" swivel casters with locks.
· 3.5" – 6" height-adjustable and interchangeable legs.
· Left hinged door.

Ref/ Frz/Dual	Doors	Capacity Cu. Ft.	Shelves	Refrigerant	HP	Power V-Hz-Ph	Amps	Crated Weight	Exterior Dimensions		
									L	D	H*
REF	2	48	6	R-290	1/4+	115-60-1	3.8	401 lbs (182kg)	49.625" (1260mm)	31.625" (803mm)	74.25" (1886mm)

(†)Based on evaporating temperature of 23ºF (-5ºC) & condensing temperature of 131ºF (55ºC). (▶) Product capacity is calculated based on standard industry figures. (⁎) Reference plan view for clarification on caster/unit height. If dimensions and capacity are critical, please contact Everest Refrigeration. Blizzard R290 replacement is at the sole discretion of Everest Refrigeration. Specifications subject to change without notice.

UPRIGHT REACH-IN REFRIGERATOR
TOP MOUNT CONDENSING UNIT

www.EVERESTref.com

ES Series Model: ESR2

DIMENSIONAL DATA

External Dimensions	L	49.625" (1260mm)
	D	31.625" (803mm)
	H*	74.25" (1886mm)
Crated Weight		401 lbs. (182kg)
Doors/Drawers/Lids		2
Max Weight Support (LBS)		-

STORAGE DATA

Net Capacity Cu. Ft. ⚑	48
Shelves	6
Barrels	-
20 oz. Bottles	-
12 oz. Bottles	-
12 oz. Cans	-
8" Mugs	-
# of Pans (Top)	-
# of Pans (Drawer)	-
Dividers	-
Trays	-

ELECTRICAL DATA

Voltage	115-60-1
Full Load Amperage	3.8A
Feed Wires with Ground	3
Cord Length	9ft
NEMA Plug Type	NEMA 5-15P

REFRIGERATION DATA

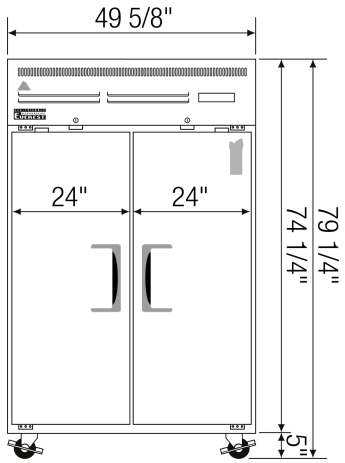
Compressor Mounting	Top
Refrigerant	R-290
Compressor HP	1/4+
BTU/HR †	1926

KEY

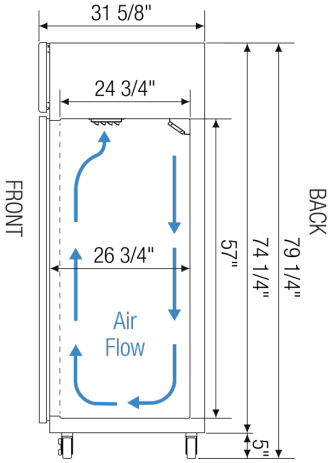
D	Door	R	Refrigerator
L	Lid	REF	Refrigerator
H	Half Door	F	Freezer
FD	Full Door	FRZ	Freezer
SD	Solid Door	DUAL	REF/FRZ Combo
GD	Glass Door	DR	Drawer

Elevation	Right	Plan	3D	Back

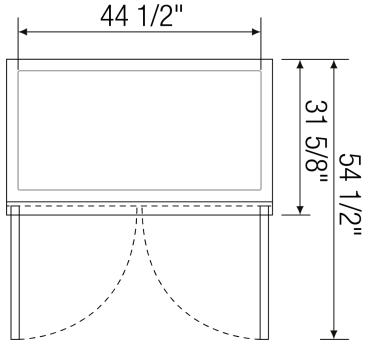
PLAN VIEW



FRONT



SIDE



TOP

ACCESSORIES & OPTIONS

Part Number	Description
Additional Shelving	Contact Everest Refrigeration for more information.
AJL03-00	Interchangeable Leg for Caster
CASA3-01	3" Overall Height Caster Assembly - (2) Front (2) Rear
Left Hinged Door	Contact Everest Refrigeration for more information.

(†)Based on evaporating temperature of 23ºF (-5ºC) & condensing temperature of 131ºF (55ºC). (⚑) Product capacity is calculated based on standard industry figures. (⁎) Reference plan view for clarification on caster/unit height. If dimensions and capacity are critical, please contact Everest Refrigeration. Blizzard R290 replacement is at the sole discretion of Everest Refrigeration. Specifications subject to change without notice.

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 35 Quantity: 1
Manufacturer: VOLLRATH
Model: 40757
Description: MIXER

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 10 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½	X	¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
Planetary Mixer, bench model, 20 quart, 20-3/8"W x 20-3/8"D x 35-5/8"H, 3-speed belt driven transmission, #12 attachment hub, digital timer with automatic stop & audible shutoff signal, thermal overload protection, includes: dough hook, wire whisk, flat beater, stainless mixing bowl, safety bowl guard, 1/2 HP, 110- 120v/60/1-ph, 10 amps, cord with NEMA 5-15P, NSF, cETLus, imported (MIX1020) (Refer to vollrathfoodservice.com for full warranty policy) 1 ea Warranty period is 2 years on parts, 1 year on labor & 5 years on belt

Reviewer's Stamp:

Outperform every day.™

Project:

Item Number:

Quantity:

BENCH AND FLOOR MIXERS



20 Quart



30 Quart



40 Quart



60 Quart

Bench and Floor Mixers

MODELS

Item No.	Model No.	Description
40757	MIX1020	Bench – 20 Quart (US and Canada)
40758	MIX1030	Floor – 30 Quart (US and Canada)
40759	MIX1040	Floor – 40 Quart (US and Canada)
40760	MIX1060	Floor – 60 Quart (US and Canada)

FEATURES

- Three speed belt driven
- Safety cut-switch temporarily interrupts power if gears are changed without stopping the mixer
- 30 minute timer stops the mixer when timer ends
- 60 quart model includes bowl truck for convenient bowl transport
- Meat grinder, vegetable slicer, reducer kits, and other accessories available
- Number 12 hub accommodates Vollrath brand meat grinder and vegetable slicer attachments for flexibility between grinding, slicing, and mixing. For best results, Vollrath attachments are recommended.
- Comes standard with: dough hook, wire whisk, flat beater, stainless steel mixing bowl, and safety guard
- 6 ft. (1.8 m) cord with plug

DESCRIPTION

Vollrath's line of mixers are a standard-setting advance in value: all the features, all the workhorse durability, and all the Vollrath service, reliability, and reputation in one tough range of mixers, ready to keep you mixing strong, serving long.

WARRANTY: The warranty period is 2 years on parts, 1 year on labor and 5 years on belts. For full warranty details, please refer to www.Vollrath.com.

Agency Listings

Approvals	Date

Due to continued product improvement, please consult www.vollrath.com for current product specifications.

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www.vollrath.com

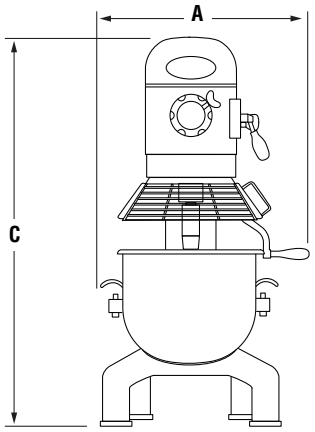
The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Customer Service: 800.628.0830
Canada Customer Service: 800.695.8560
Main Fax: 800.752.5620 or 920.459.6573

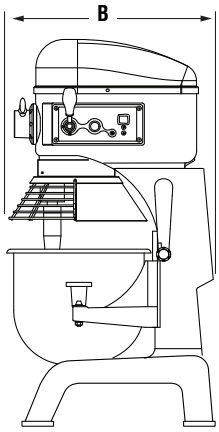
Technical Services: 800.628.0832
Technical Services Fax: 920.459.5462

BENCH AND FLOOR MIXERS

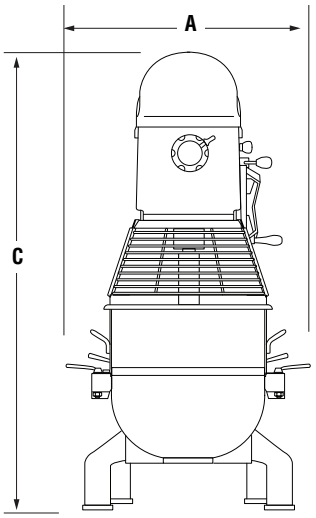
DIMENSIONS (shown in inches (cm))

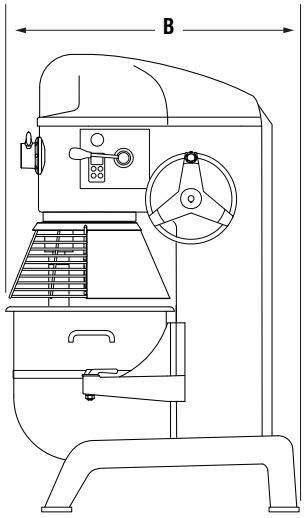
20/30/40 Quart Mixer *(20 Quart Mixer Shown)*





60 Quart Mixer

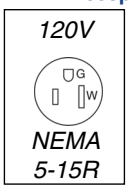


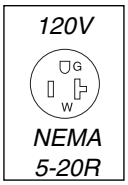


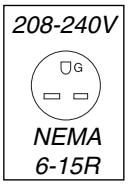
SPECIFICATIONS

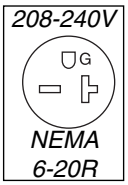
Item No.	Style	Capacity	Dimensions (A) Width	Dimensions (B) Depth	Dimensions (C) Height	Transmission	HP	Voltage	Amps	Plug
40757	Bench	20 Qt.	20⅜ (51.8)	20⅜ (51.8)	35⅝ (90.5)	3 speed	½	110-120	10	NEMA 5-15P
40758	Floor	30 Qt.	25 (63.5)	24½ (62.2)	47⅞ (121.6)	3 speed	1	110-120	16	NEMA 5-20P
40759	Floor	40 Qt.	26½ (67.3)	26 9⁄16 (67.5)	47⅛ (119.7)	3 speed	1½	208-240	12	NEMA 6-15P
40760	Floor	60Qt.	27⅜ (69.5)	30 (76.2)	55 13⁄16 (141.5)	3 speed	2	208-240	16	NEMA 6-20P

Receptacles









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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 36 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: AG-MT-302-X
Description: EQUIPMENT STAND

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½”	☐ ¾”	☐
Hot Water	½”	☐ 3/4”	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½” ☐ ¾” ☐ 1” ☐ 1 ¼” ☐
BTU: _____

Steam Requirements:

Supply:	½”	☐	1”	☐
Return:	½”	☐	1”	☐

Description / Accessories:
Special Value Equipment Stand, 24"W x 30"D x 24"H, 430 stainless steel top, galvanized adjustable undershelf, galvanized legs with adjustable plastic bullet feet, NSF 1 st Model TA-25EG Casters, 5" diameter, set of 4 (2 with brakes) with galvanized legs for 24" tall tables & mixer stands (capacity 200 lbs per caster) 1 st Model TA-255B For brakes on all (4) wheels (equipment casters) – Add to any price of the following models: TA-255, TA-356, TA-25ES & TA-25EG

Reviewer’s Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

MIXER TABLES

NSF



MX-SS-242 Shown
Mixer Not Included



MT-SS-242
Shown



AG-MT-242
Shown

Item #: _____ Qty #: _____

Model #: _____

Project #: _____

UTENSIL RACK & UNDERSHELF

	S/S Base	Galv. Base		
O.A. Size Wx L	Model	Model	Approx. Wt.	Approx. Cu. Ft.
24" x 24"	MX-SS-242	MX-GL-242	53 lbs.	3
30" x 24"	MX-SS-302	MX-GL-302	63 lbs.	3
30" x 30"	MX-SS-300	MX-GL-300	70 lbs.	4
30" x 36"	MX-SS-303	MX-GL-303	77 lbs.	4
36" x 36"	MX-SS-363	MX-GL-363	81 lbs.	5

WITH UNDERSHELF

	S/S Base	Galv. Base		
O.A. Size Wx L	Model	Model	Approx. Wt.	Approx. Cu. Ft.
24" x 24"	MT-SS-242	MT-GL-242	45 lbs.	3
30" x 24"	MT-SS-302	MT-GL-302	50 lbs.	3
30" x 30"	MT-SS-300	MT-GL-300	55 lbs.	4
30" x 36"	MT-SS-303	MT-GL-303	68 lbs.	4
36" x 36"	MT-SS-363	MT-GL-363	71 lbs.	5

BUDGET SERIES WITH UNDERSHELF

	S/S Base	Galv. Base		
O.A. Size Wx L	Model	Model	Approx. Wt.	Approx. Cu. Ft.
24" x 24"	SAG-MT-242	AG-MT-242	38 lbs.	3
30" x 24"	SAG-MT-302	AG-MT-302	41 lbs.	3
30" x 30"	SAG-MT-300	AG-MT-300	52 lbs.	4
30" x 36"	SAG-MT-303	AG-MT-303	58 lbs.	4
36" x 36"	SAG-MT-363	AG-MT-363	64 lbs.	5

FEATURES:

TOP is furnished with a 2" x 1" square die embossed NO-DRIP countertop offset edge with a 1/2" return on 4 sides.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is adjustable.

MATERIAL:

MX-SS & MT-SS SERIES - Stainless Steel Base

TOP is 14 gauge stainless steel type "304" series with galvanized understructure.

UNDERSHELF is 18 gauge stainless steel.

LEGS are 1 5/8" diameter tubular stainless steel with stainless steel bullet feet & gussets.

UTENSIL RACK on MX-SS Series is 1 5/8" dia. stainless steel tubing with stainless steel hooks.

MX-GL & MT-GL Series - Galvanized Steel Base

TOP is 14 gauge stainless steel type "304" series with galvanized understructure.

UNDERSHELF is galvanized steel.

LEGS are 1 5/8" diameter, tubular galvanized steel. Gussets are galvanized steel with 1" adjustable plastic bullet feet.

UTENSIL RACK on MX-SS Series is 1 5/8" diameter galvanized steel tubing with stainless steel hooks.

SAG-MT & AG-MT Budget Series

TOP is heavy gauge stainless steel type "430" series with galvanized understructure.

SAG-MT Series UNDERSHELF is 18 gauge stainless steel.
AG-MT Series UNDERSHELF is galvanized steel.

SAG-MT Series LEGS are 1 5/8" diameter, tubular stainless steel. Gussets are stainless steel. 1" adjustable stainless steel bullet feet.

AG-MT Series LEGS are 1 5/8" diameter, tubular galvanized steel. Gussets are galvanized steel. 1" adjustable plastic bullet feet.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surface.

Entire Top is mechanically polished to a satin finish and is sound deadened. Countertop edge polished to a MIRROR FINISH.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat channels.

ADVANCE TABCO
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www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

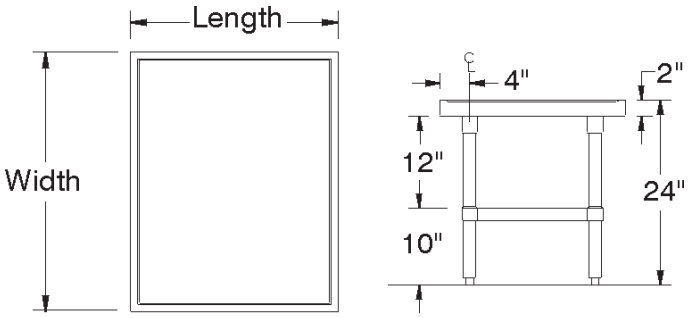
For Orders & Customer Service:
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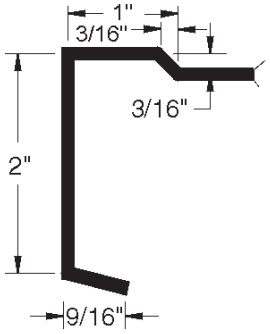
DETAILS and SPECIFICATIONS

TOL ± .500”

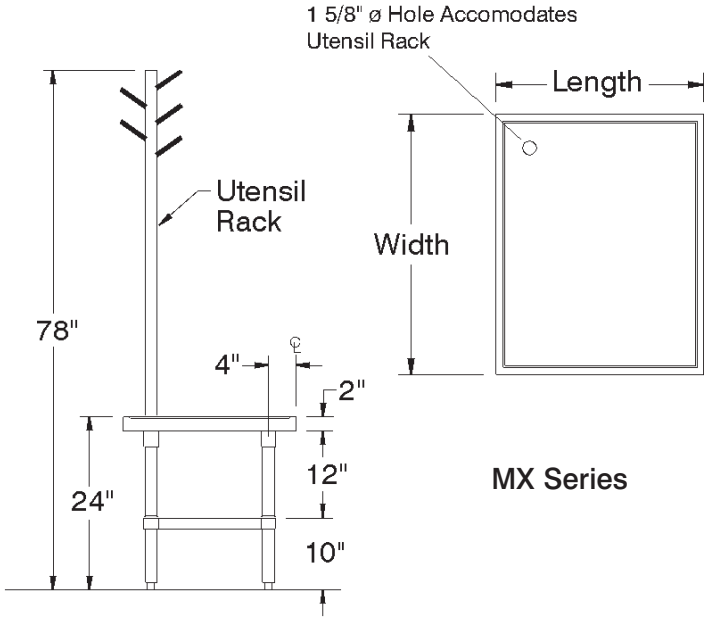
ALL DIMENSIONS ARE TYPICAL



MT, SAG & AG Series



Countertop Edge Detail



MX Series

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, JUNE 2020

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 37 Quantity: 1
Manufacturer: VOLLRATH
Model: 40951
Description: SLICER

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 1.8 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

2/5	X	¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½”		¾”		
Hot Water	½”		3/4”		

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½” [ ] ¾” [ ] 1” [ ] 1 ¼” [ ]
BTU: _____

Steam Requirements:

Supply:	½”		1”	
Return:	½”		1”	

Description / Accessories:
Slicer, medium duty, manual, 25° gravity feed, 12" blade, 24"W x 25-3/16"D x 20-1/16"H, belt drive, slice thickness up to 1/2", QuanTanium® coated non-stick plate, anodized aluminum body, non-skid rubber feet, 2/5 hp, 120v/60/1-ph, 1.8 amps, cord with NEMA 5-15P, cULus, UL EPH Classified, UL-Sanitation, model #SLM300P/S (replaces discontinued item 40902) (Refer to vollrathfoodservice.com for full warranty policy) 1 ea 1 year on parts, 1 year on labor & 5 years on belt warranty

Reviewer’s Stamp:

Outperform every day.™

Project:

Item Number:

Quantity:

MEDIUM-DUTY ELECTRIC SLICERS



40950



40951

Medium-Duty Electric Slicers

DESCRIPTION

The Vollrath Medium-Duty Electric Slicers are available with either a 10" or 12" blade. They are ideal for slicing meats in medium-volume operations and small restaurants.

ITEMS

Item No.	Model No.	Description
40950	SLM250/S	10" Medium-Duty Slicer, 25º
40951	SLM300P/S	12" Medium-Duty Slicer, 25º

FEATURES

- QuanTanium® coated non-stick plate with titanium blended into the coating creates a harder and more durable surface than conventionally reinforced systems
- Non-stick plate increases glide performance and reduces clean-up time
- Built-in sharpener
- 25 degree gravity feed maximizes productivity by reducing operator fatigue and discomfort
- Safety hand guard mounted to carriage
- Safety cover under motor
- Hard coated anodized aluminum body
- Non-marking, non-skid rubber feet
- Belt driven. Durable, long-wearing belt provides reliable service.
- Slice adjustment knob for precise and consistent slice thickness
- Removable carriage for easy cleaning
- 6'4" (1.9 m) cord with plug

40950

- 1/3 peak HP motor
- 10" blade
- Space-saving design with small footprint
- Easy to carry for catering needs

40951

- 2/5 peak HP motor
- 12" blade
- Permanent blade rim guard for safety
- Great cutting capacity within a compact footprint

ACCESSORIES

- ❑ 40896 - 12" serrated blade, fits 40951
- ❑ 40898 - 10" safe blade removal tool, fits 40950
- ❑ 40893 - 12" safe blade removal tool, fits 40951
- ❑ 40899 - Carriage handle for Quebec, fits 40950 and 40951

Warranty

1 year on parts, 1 year on labor and 5 years on the belt. See Vollrath.com for full warranty details.

Approvals	Date

Agency Listings

FUNCTIONAL SAFETY c UL us LISTED

CLASSIFIED UL EPH

SANITATION CLASSIFIED UL NSF/ANSI 8 E480414

Certified to NSF/ANSI 8

Due to continued product improvement, please consult www.vollrath.com for current product specifications.

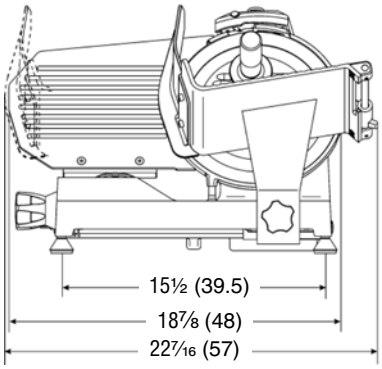
The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Main Tel: 800.624.2051 or 920.457.4851
Main Fax: 800.752.5620 or 920.459.6573
Customer Service: 800.628.0830
Canada Customer Service: 800.695.8560

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techservicereps@vollrathco.com
Induction Products: 800.825.6036
Countertop Warming Products: 800.354.1970
All Other Products: 800.628.0832

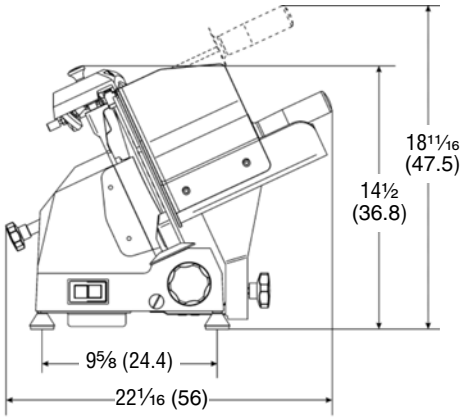
MEDIUM-DUTY ELECTRIC SLICERS

DIMENSIONS (Shown in inches (cm))

40950

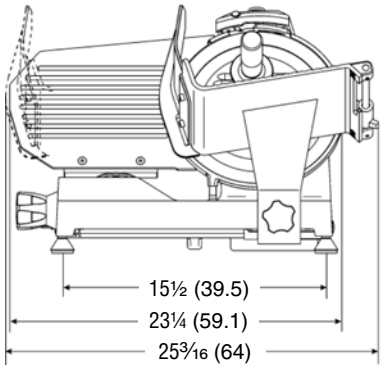


Side View

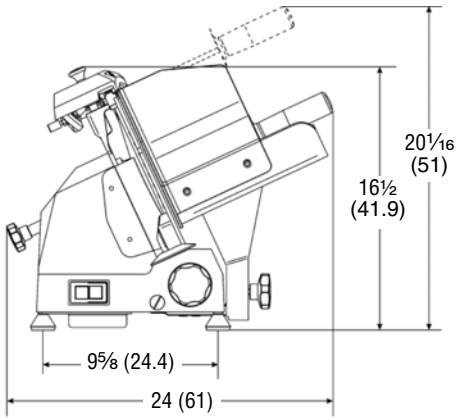


Front View

40951



Side View



Front View

SPECIFICATIONS

Item	Description	Peak HP	Voltage	Amps	Hertz	Weight Lbs (Kg)	Plug
40950	10" Medium-Duty Slicer, 25°	1/3	120	2.5	60	35 (16)	NEMA 5-15P
40951	12" Medium-Duty Slicer, 25°	2/5		1.8		45 (20)	

Receptacle

120V



NEMA 5-15R

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The Vollrath Company, L.L.C.
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Main Tel: 800.624.2051 or 920.457.4851
Main Fax: 800.752.5620 or 920.459.6573
Customer Service: 800.628.0830

Technical Services
techservicereps@vollrathco.com
Induction Products: 800.825.6036
Countertop Warming Products: 800.354.1970
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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 38 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: MT-MG-300
Description: EQUIPMENT STAND

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½"	☐ ¾"	☐
Hot Water	½"	☐ 3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐ 1"	☐
Return:	½"	☐ 1"	☐

Description / Accessories:

Reviewer's Stamp:

STAINLESS STEEL

MOBILE MIXER & EQUIPMENT TABLES

Item #: _____ Qty #: _____

Model #: _____

Project #: _____



MOBILE
MIXER TABLE



MIXER
EQUIPMENT
TABLE

Drawer Optional

MOBILE MIXER TABLES

O.A. W x L	Model #	Style	Weight
30" x 30"	MT-MS-300	Stainless Steel	85 lbs.
30" x 36"	MT-MS-303	Stainless Steel	95 lbs.
30" x 30"	MT-MG-300	Galvanized	85 lbs.
30" x 36"	MT-MG-303	Galvanized	95 lbs.

MIXER EQUIPMENT TABLES

O.A. W x L	Model #	Style	Weight
24" x 30"	AG-MP-30	Stainless Steel	65 lbs.

MOBILE MIXER TABLE with Tray Slides

FEATURES:

TOP is furnished with a 2" x 1" square die embossed NO-DRIP countertop offset edge with a 1/2" return on 4 sides.

Cross Bracing welded to front legs. Cross Bracing on sides is bolted to legs and requires assembly.

Pan Rack Slides sized for (6) 18" x 26" pans.

MATERIAL:

MT-MS SERIES - Stainless Steel Base

TOP is 14 gauge stainless steel type "304" series with galvanized understructure.

LEGS are 1 5/8" diameter, stainless steel. Gussets are stainless steel. (4) 5" swivel casters with rubber wheels. (2) with brakes

PAN RACK is aluminum with 2" tray slide spacing.

MT-MG SERIES - Galvanized Base

TOP is 14 gauge stainless steel type "304" series with galvanized understructure.

LEGS are 1 5/8" diameter, galvanized steel. Gussets are galvanized steel.

(4) 5" swivel casters with rubber tires. (2) with brakes.

PAN RACK is aluminum with 2" tray slide spacing.

MIXER EQUIPMENT TABLE

FEATURES:

TOP is furnished with a 2" x 1" square die embossed NO-DRIP countertop offset edge with a 1/2" return on 4 sides.

Aluminum die cast "leg to shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is adjustable.

Pre-engineered angle adapters insure ease of future drawer installation (Mixer Equipment Table Only).

Stainless steel handle and two rubber bumpers secured to table top.

MATERIAL:

AG-MP-30

TOP is heavy gauge stainless steel type "430" series with galvanized understructure.

UNDERSHELF is galvanized steel.

LEGS are 1 5/8" dia. tubular galvanized steel with galvanized steel gussets and (2) 1" adjustable plastic bullet feet.

(2) 5" swivel casters with brakes supplied.

CONSTRUCTION:

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat sections.

All TIG welded. Exposed weld areas finished to match adjacent surfaces.

Entire Top is mechanically polished to a satin finish and is sound deadened.

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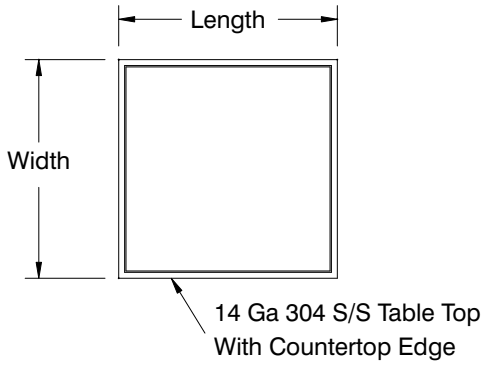
DETAILS and SPECIFICATIONS

TOL ± .500”

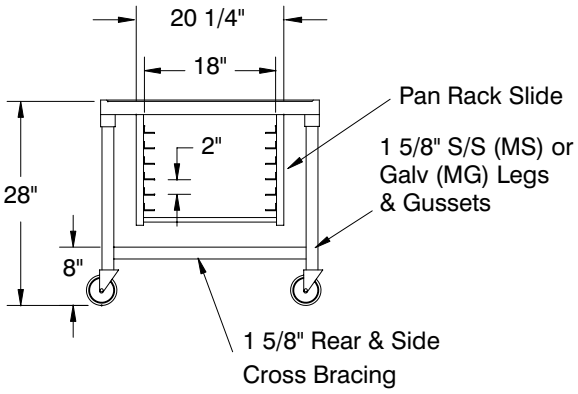
ALL DIMENSIONS ARE TYPICAL

MOBILE MIXER TABLE with Tray Slides

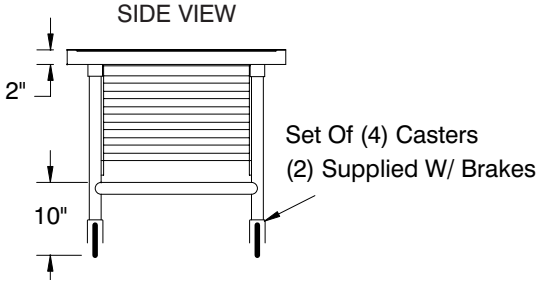
TOP VIEW



FRONT VIEW

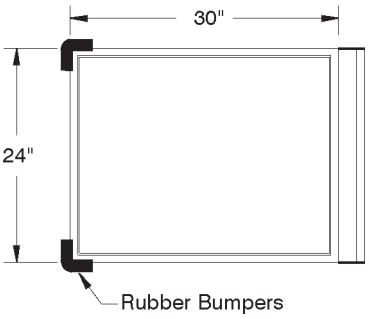


SIDE VIEW

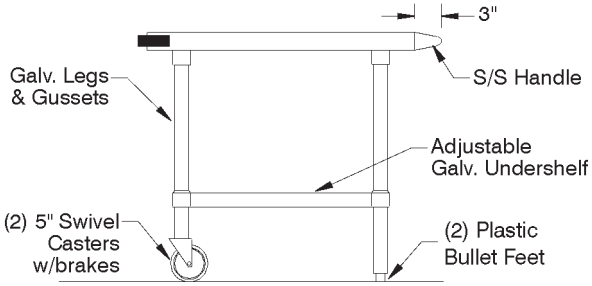


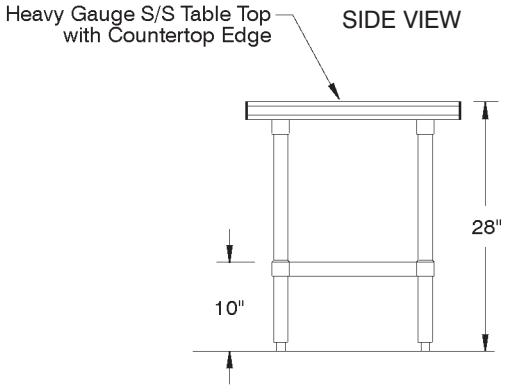
MIXER EQUIPMENT TABLE

TOP VIEW

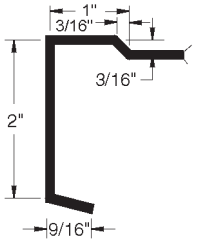


FRONT VIEW





Countertop
Edge Detail



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325 Wireless Boulevard, Hauppauge, NY 11788

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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 39 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 40 Quantity: 3
Manufacturer: ADVANCE TABCO
Model: NR-20
Description: NESTING PAN RACK

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Special Value Rack, mobile pan, full height, nesting design, open sides, with angle tray guides on 3" centers, capacity 20 - 18" x 26" sheet pans or 40 - half-size pans, all-welded aluminum construction, front loading, 69-1/4" high 3 ea Model PRC-2 Rack Cover, economy, clear plastic

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

ALUMINUM

NESTING PAN RACK NSF

Item #: _____ Qty #: _____

Model #: _____

Project #: _____

SPACESAVING DESIGN

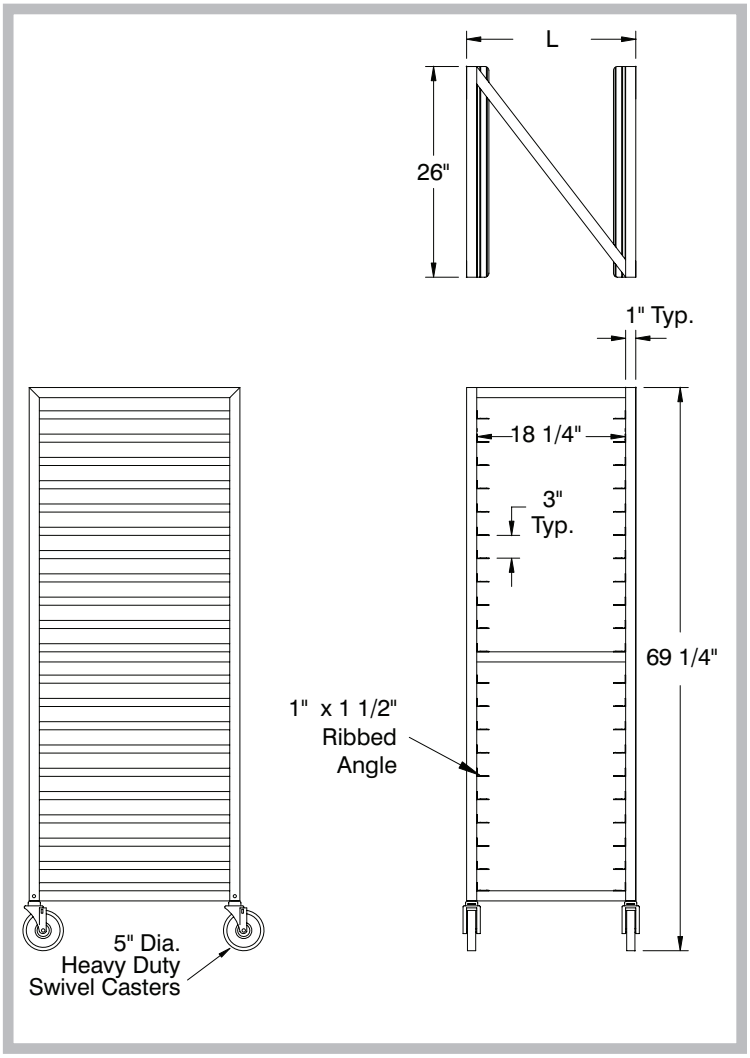


NR-20 Shown

DIMENSIONS and SPECIFICATIONS

TOL ± .500"

ALL DIMENSIONS ARE TYPICAL



FEATURES:

Nesting design to facilitate maximum storage in minimum space.

Heavy Duty welded construction.

12 or 20 Pan capacity.

1" x 1-1/2" ribbed angles.

Heavy Duty 5" Stem Swivel Casters.

500 lb. Maximum Load.

CONSTRUCTION:

Fully welded 1" square tubing frame and diagonal cross supports.

Angles are 1" x 1/1/2" fully welded

MATERIAL:

Extruded aluminum angles, upright tubing and support pieces.

MODEL #	Pan Capacity	Shelf Spacing	Overall Size L x W x H	Weight
NR-20	20 Full or 40 Half Size	3"	21" x 26" x 69 1/4"	29 lbs.

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Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 41 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: 9-OP-44
Description: MOP SINK

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	X	¾"	☐		
Hot Water	½"	X	3/4"	☐		

140 ☐ 180 ☐

Waste Requirements:
Direct ☒ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
Mop Sink, floor mounted, 29"W x 29"D x 16"H (overall), 24"W x 24" front-to-back x 12" deep (bowl size), free flow drain with 2" IPS outlet, stainless steel construction 1 ea Model K-240 Service Sink Faucet, wall mount, heavy duty, 8" OC, 6-1/2" spout, with hose thread & pail hook, vacuum breaker spout, wall braced, chrome-plated brass 1 ea Model K-06 Splash Mount Faucet Mounting Kit, for K-1, K-11, K-101, K-105, K-112, K-119 & K-211 faucets 1 ea Model K-242 Mop Hanger, 23", accommodates (3) 1 ea Model DT-6R-36 Drainage Shelf, wall mount, tubular design, 36"W x 15"D x 8"H, stainless steel, KD

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

FABRICATED FLOOR MOP SINKS

Item #: _____ Qty #: _____
Model #: _____
Project #: _____



Standard Mop Sink
9-OP-20 Shown



Drop Front Mop Sink
9-OP-40DF Shown

FEATURES:

Floor mounted unit eliminates the need of lifting heavy containers.

Tile edge furnished on the rear.

Bowls rectangular in design for increased capacity.

K-16 Free Flow Drain is included with each mop sink.

-DF models feature a notched out front which allows for ease of emptying mop bucket)

CONSTRUCTION:

All TIG welded.

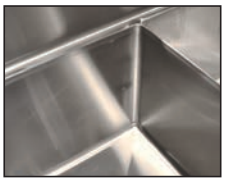
Welded areas blended to match adjacent surfaces and to a satin finish.

MATERIAL:

16 Gauge type "304" series stainless steel sink bowl & Apron.



Notched Out Front Allows Ease of Emptying Mop Bucket



Fabricated Bowls are Welded Together at the Seams

	Model #	Bowl Size (A x B x C)	O.A. Dimension (W x L x H)	Drain Distance (E)	Drain Distance (F)	Approx. Wt.	Approx. Cu.
STANDARD	9-OP-18	15" x 15" x 10"	18" x 18" x 14"	9"	9"	30 lbs.	4
	9-OP-20	16" x 20" x 6"	21" x 25" x 10"	10-1/2"	12-1/2"	33 lbs.	4
	9-OP-28	20" x 28" x 6"	25" x 33" x 10"	12-1/2"	16-1/2"	47 lbs.	7
	9-OP-40	16" x 20" x 12"	21" x 25" x 16"	10-1/2"	12-1/2"	45 lbs.	6
	9-OP-48	20" x 28" x 12"	25" x 33" x 16"	12-1/2"	16-1/2"	62 lbs.	9
LARGE BOWL	9-OP-44	24" x 24" x 12"	29" x 29" x 16"	14-1/2"	14-1/2"	70 lbs.	9
	9-OP-33	24" x 36" x 12"	29" x 41" x 16"	14-1/2"	20 1/2"	73 lbs.	9
	9-OP-34	24" x 48" x 12"	29" x 53" x 16"	14-1/2"	26 1/2"	76 lbs.	9
DROP FRONT	9-OP-40DF	16" x 20" x 12"	18-1/2" x 25" x 16"	10-1/2"	12-1/2"	85 lbs.	9
	9-OP-48DF	20" x 28" x 12"	22-1/2" x 33" x 16"	12-1/2"	16-1/2"	110 lbs.	15

MOP SINK ACCESSORIES

16" High Side & Back Splashes for 9-OP Series Mop Sinks

16 Gauge



Left & Right Splashes Shown

Splashes on All 3 Sides

Model #	Fits Units:	Model #	Fits Units:
K-298	9-OP-20 9-OP-40	K-298D	9-OP-40DF
K-299	9-OP-28 9-OP-48	K-299D	9-OP-48DF
K-300	9-OP-44	-	-

Splash on Left or Right & Back

Model #	Fits Units:	Model #	Fits Units:
K-288LorR	9-OP-20 9-OP-40	K-288LorRD	9-OP-40DF
K-290LorR	9-OP-28 9-OP-48	K-290LorRD	9-OP-48DF
K-291LorR	9-OP-44	-	-

Height Above Finished Floor (A.F.F.)
9-OP-20/9-OP-28 = 26" High 9-OP-40/9-OP-40DF/9-OP-44/9-OP-48/ 9-OP-48DF = 32" High

K-16 Replacement drain for floor mop sinks
K-240 Service Faucet*
K-242 23" wide mop hanger
K-243 Stainless steel mop drainage tray
K-244 Hose and hanger
K-245 8" x 24" utility shelf
K-246 8" x 36" utility shelf

*Does not meet Federal Lead Free Standards as it is not intended for potable water.



K-243



K-240



K-245



K-242



K-16



K-244

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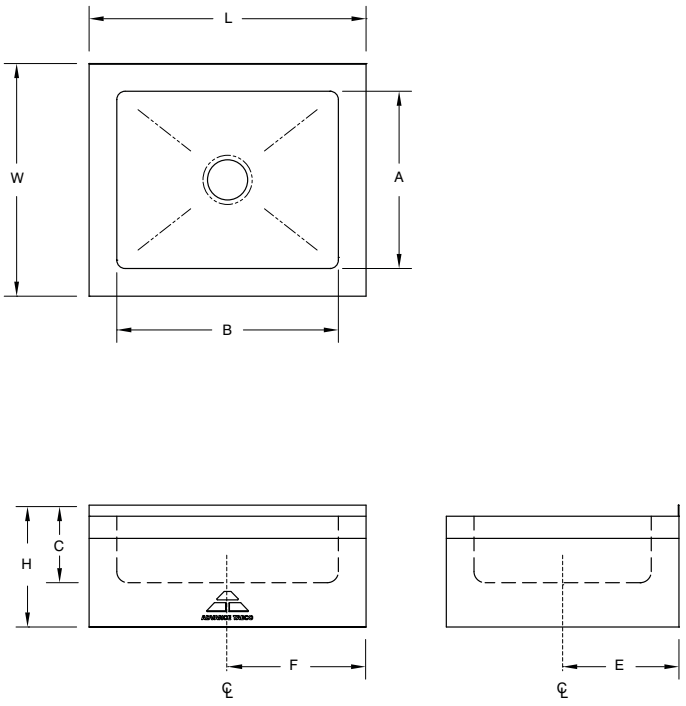
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DIMENSIONS and SPECIFICATIONS

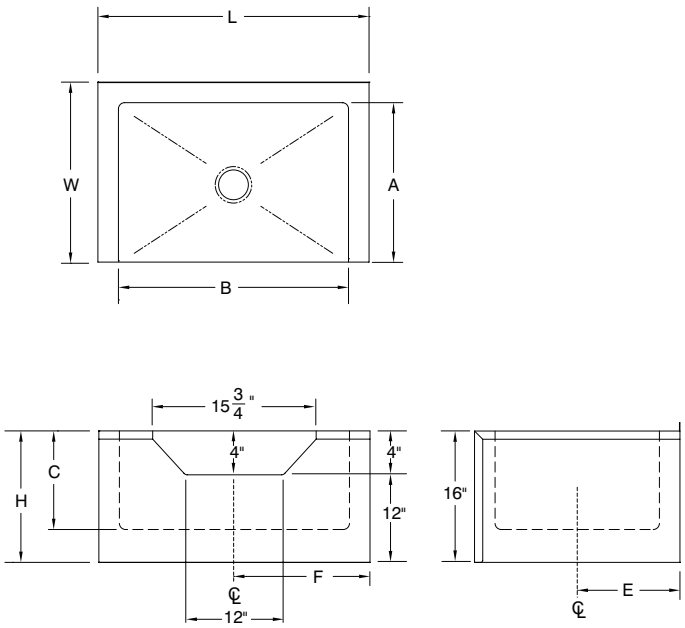
TOL Overall: ± .500”
Interior: ± .250”

ALL DIMENSIONS ARE TYPICAL

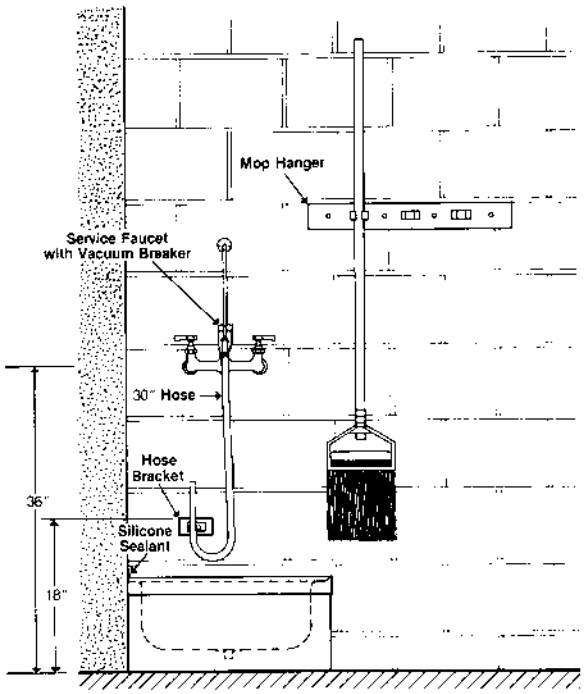
STANDARD MOP SINK



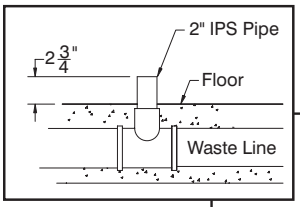
DROP FRONT MOP SINK

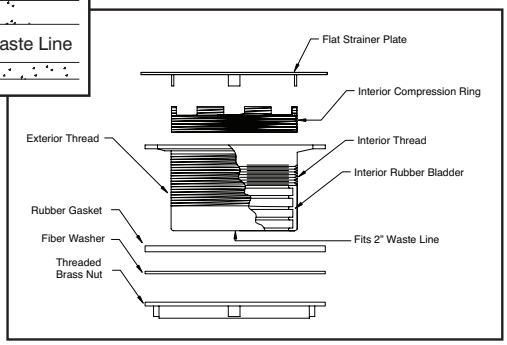


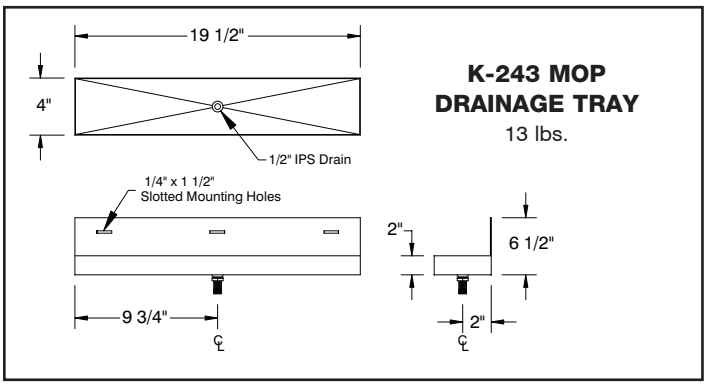
SUGGESTED INSTALLATION



MOP SINK DRAIN ASSEMBLY







K-243 MOP DRAINAGE TRAY
13 lbs.

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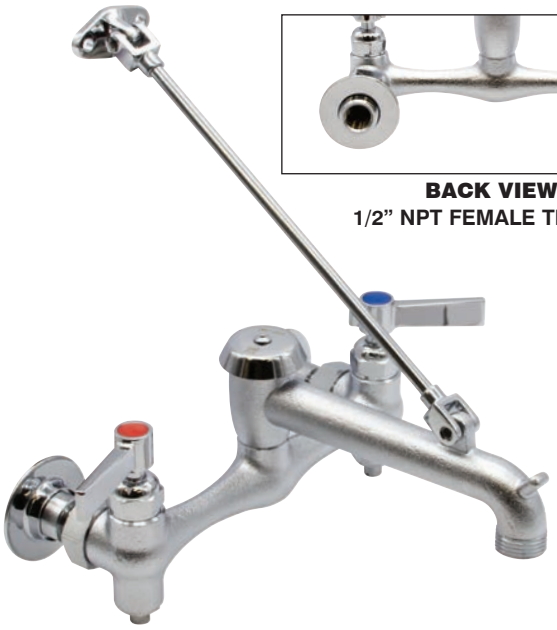
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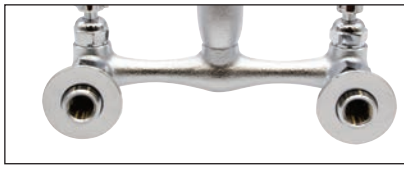
K-240
SERVICE FAUCET FOR MOP SINKS

Item #: _____ Qty #: _____

Model #: _____

Project #: _____





BACK VIEW
1/2" NPT FEMALE THREAD

FEATURES:

8" O.C. water supply.

Quarter turn wedge style handles with colored hot & cold Indexes.

9.6 GPM/36.3 LPM.

Wall support bracket & pail hook.

Vacuum breaker. Built-in stops.

Garden hose outlet.

MATERIAL:

Brass chrome plated body & spout.

Chrome plated handles.



Click This Link To View Assembly Sheet

Options & Accessories



Replacement Vacuum Breaker Repair Kit For K-240



K-03



Faucet Repair Kit*

K-00B (Set of 2)

Includes 2 Cartridges and 2 Handles
With Red & Blue Indexes

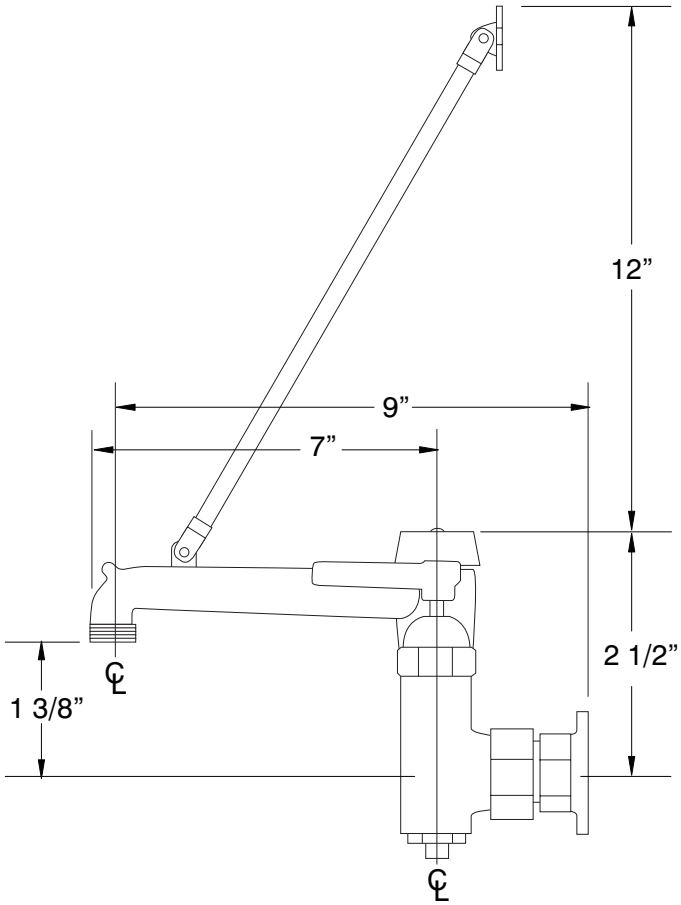


*Can Only Be Used On Faucets Purchased After January 2016.
For Older Faucets, Consult Customer Service.

⚠ WARNING:

Faucet(s) on this page may expose you to chemicals, including lead, that are known to the State of California to cause cancer or birth defects or other reproductive harm. For more Info.,visit www.p65warnings.ca.gov.

DIMENSIONS and SPECIFICATIONS



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STAINLESS STEEL

FABRICATED FLOOR MOP SINKS

Item #: _____ Qty #: _____
Model #: _____
Project #: _____



Standard Mop Sink
9-OP-20 Shown



Drop Front Mop Sink
9-OP-40DF Shown

FEATURES:

Floor mounted unit eliminates the need of lifting heavy containers.

Tile edge furnished on the rear.

Bowls rectangular in design for increased capacity.

K-16 Free Flow Drain is included with each mop sink.

-DF models feature a notched out front which allows for ease of emptying mop bucket)

CONSTRUCTION:

All TIG welded.

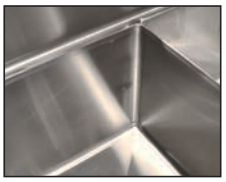
Welded areas blended to match adjacent surfaces and to a satin finish.

MATERIAL:

16 Gauge type "304" series stainless steel sink bowl & Apron.



Notched Out Front Allows Ease of Emptying Mop Bucket



Fabricated Bowls are Welded Together at the Seams

	Model #	Bowl Size (A x B x C)	O.A. Dimension (W x L x H)	Drain Distance (E)	Drain Distance (F)	Approx. Wt.	Approx. Cu.
STANDARD	9-OP-18	15" x 15" x 10"	18" x 18" x 14"	9"	9"	30 lbs.	4
	9-OP-20	16" x 20" x 6"	21" x 25" x 10"	10-1/2"	12-1/2"	33 lbs.	4
	9-OP-28	20" x 28" x 6"	25" x 33" x 10"	12-1/2"	16-1/2"	47 lbs.	7
	9-OP-40	16" x 20" x 12"	21" x 25" x 16"	10-1/2"	12-1/2"	45 lbs.	6
	9-OP-48	20" x 28" x 12"	25" x 33" x 16"	12-1/2"	16-1/2"	62 lbs.	9
LARGE BOWL	9-OP-44	24" x 24" x 12"	29" x 29" x 16"	14-1/2"	14-1/2"	70 lbs.	9
	9-OP-33	24" x 36" x 12"	29" x 41" x 16"	14-1/2"	20 1/2"	73 lbs.	9
	9-OP-34	24" x 48" x 12"	29" x 53" x 16"	14-1/2"	26 1/2"	76 lbs.	9
DROP FRONT	9-OP-40DF	16" x 20" x 12"	18-1/2" x 25" x 16"	10-1/2"	12-1/2"	85 lbs.	9
	9-OP-48DF	20" x 28" x 12"	22-1/2" x 33" x 16"	12-1/2"	16-1/2"	110 lbs.	15

MOP SINK ACCESSORIES

16" High Side & Back Splashes for 9-OP Series Mop Sinks

16 Gauge



Left & Right Splashes Shown

Splashes on All 3 Sides

Model #	Fits Units:	Model #	Fits Units:
K-298	9-OP-20 9-OP-40	K-298D	9-OP-40DF
K-299	9-OP-28 9-OP-48	K-299D	9-OP-48DF
K-300	9-OP-44	-	-

Splash on Left or Right & Back

Model #	Fits Units:	Model #	Fits Units:
K-288LorR	9-OP-20 9-OP-40	K-288LorRD	9-OP-40DF
K-290LorR	9-OP-28 9-OP-48	K-290LorRD	9-OP-48DF
K-291LorR	9-OP-44	-	-

Height Above Finished Floor (A.F.F.)
9-OP-20/9-OP-28 = 26" High 9-OP-40/9-OP-40DF/9-OP-44/9-OP-48/ 9-OP-48DF = 32" High

K-16 Replacement drain for floor mop sinks
K-240 Service Faucet*
K-242 23" wide mop hanger
K-243 Stainless steel mop drainage tray
K-244 Hose and hanger
K-245 8" x 24" utility shelf
K-246 8" x 36" utility shelf

*Does not meet Federal Lead Free Standards as it is not intended for potable water.



K-243



K-240



K-245



K-242



K-16



K-244

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SMART FABRICATION™
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Email: customer@advancetabco.com or **Fax:** 631-242-6900

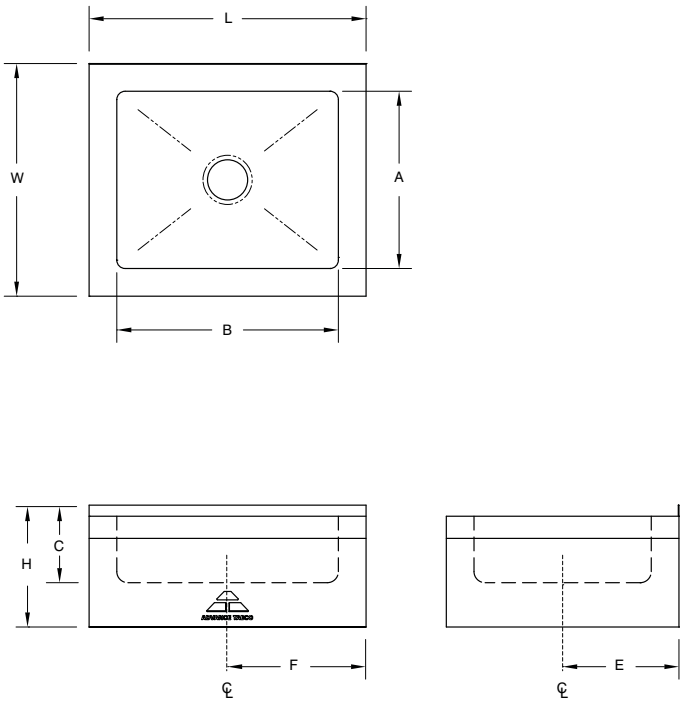
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

DIMENSIONS and SPECIFICATIONS

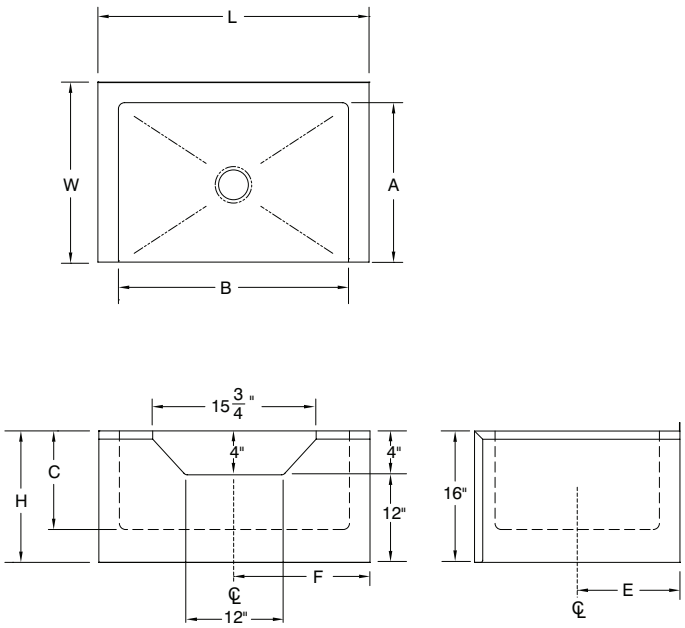
TOL Overall: ± .500”
Interior: ± .250”

ALL DIMENSIONS ARE TYPICAL

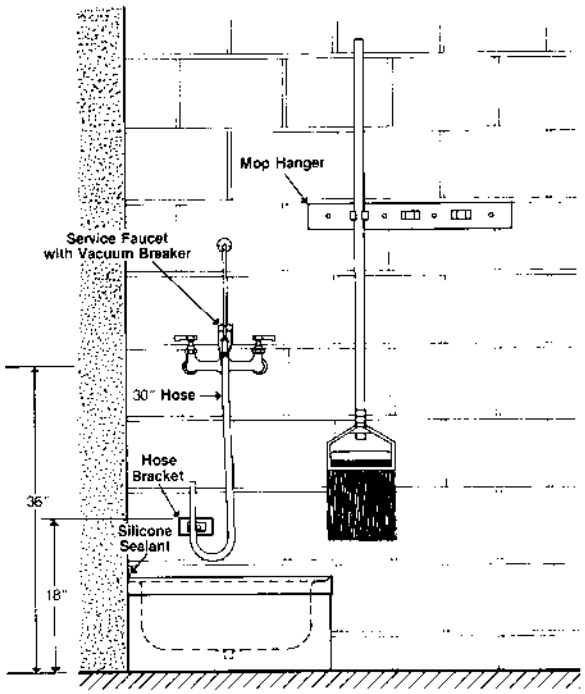
STANDARD MOP SINK



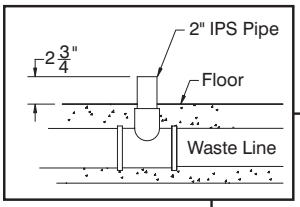
DROP FRONT MOP SINK

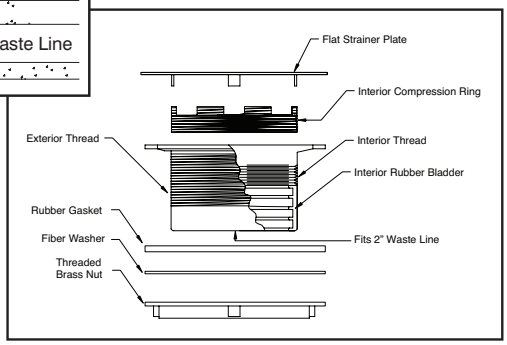


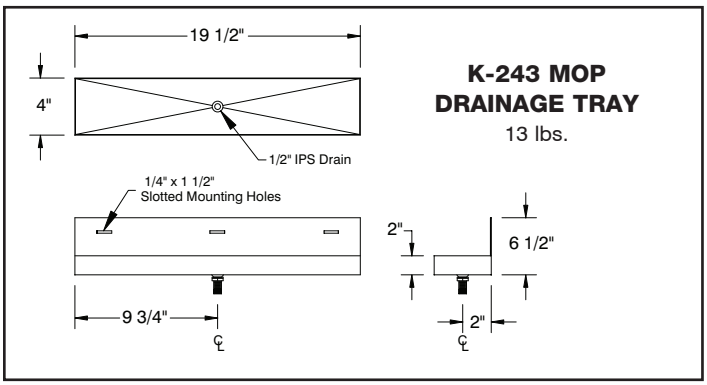
SUGGESTED INSTALLATION



MOP SINK DRAIN ASSEMBLY







K-243 MOP DRAINAGE TRAY
13 lbs.

ADVANCE TABCO
SMART FABRICATION™

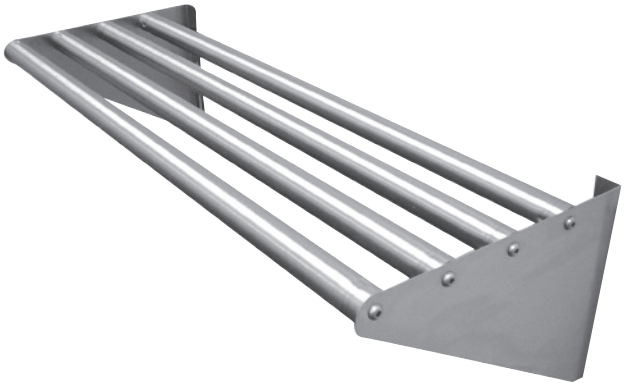
325 Wireless Boulevard, Hauppauge, NY 11788

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© ADVANCE TABCO, APRIL 2025

STAINLESS STEEL

TUBULAR WALL MOUNTED KNOCKDOWN DRAINAGE SHELVES



Item #: _____ Qty #: _____

Model #: _____

Project #: _____

Model	Length	Wt.	Cu.
DT-6R-36	15" x 36"	23	2
DT-6R-48	15" x 48"	32	3
DT-6R-60	15" x 60"	39	4
DT-6R-72	15" x 72"	46	5

FEATURES:

15" Deep, horizontal surface area accommodates a variety of drainage applications.

CONSTRUCTION:

Knock Down Design for ease of field installation and lower freight costs.

MATERIAL:

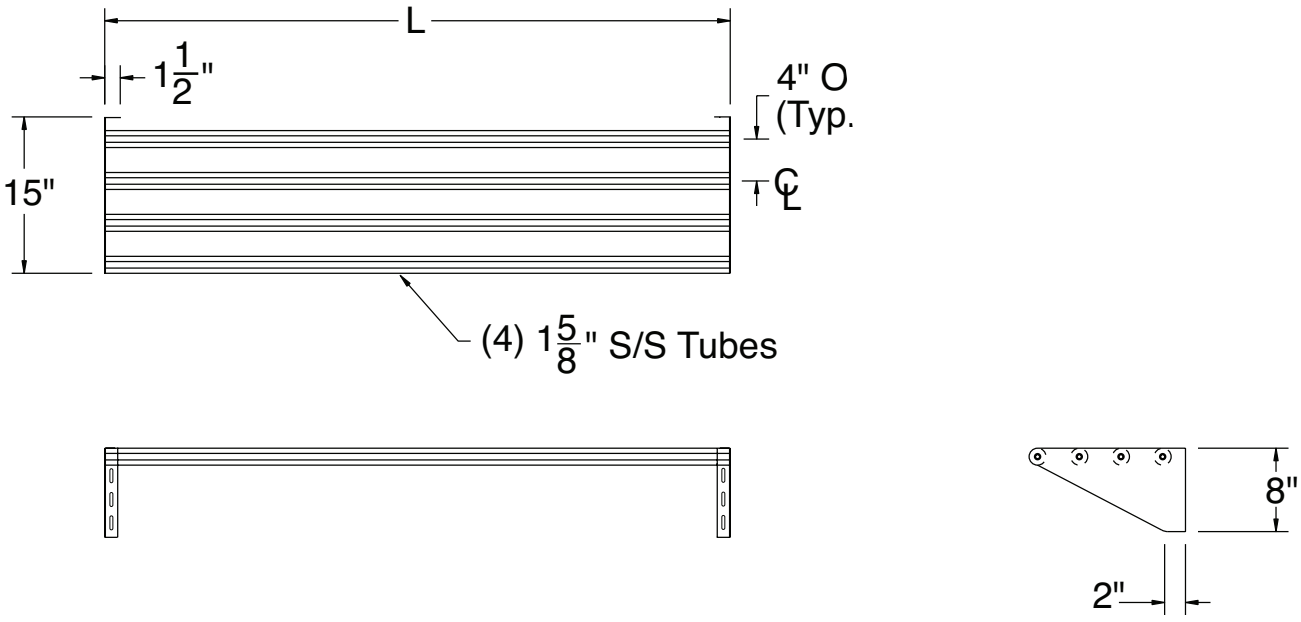
1 5/8" diameter stainless steel type "300" tubing.

Side brackets type "300" stainless steel.

DETAILS and SPECIFICATIONS

TOL ± .500"

ALL DIMENSIONS ARE TYPICAL



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 42 Quantity: 1
Manufacturer: SUMMIT
Model: AL54PNR
Description: UNDERCOUNTER REFRIGERATOR

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 0.8 KW: _____
Phase: 1 X 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
All-Refrigerator, 24" wide, 5.1 cu.ft, black exterior, counter height dimensions, height adjustable, leg shield included, panel ready door, flat door liner, right swing door, automatic defrost, interior light on rocker switch, black interior, removable crisper drawer, (3) adjustable glass shelves, bottle shelf included, 2 level legs, dial controls, quiet operation, R600a hydrocarbon refrigerant, CARB compliant, 100% CFC free, 115v/60/1-ph, ETL, ETL-C, (Residential)

Reviewer's Stamp:

AL54PNR



32" x 23.38" x 22.63" (H x W x D)

Built-in undercounter ADA compliant all-refrigerator with panel-ready door, black cabinet, door storage, and digital controls

Highlights:

32" height fits under lower ADA compliant counters

Flexible design allows built-in or freestanding use in 24" wide spaces

Customizable door front accepts full overlay panels for a seamless look that can blend into cabinetry

Product Features:

24" Wide ADA Height All-Refrigerator	Panel-ready refrigerator sized at 32" high for built-in installation under ADA compliant counters
Custom style	Door accepts overlay panel, allowing you to seamlessly blend the refrigerator into your space
ADA compliant design	32" height allows easy installation under lower ADA compliant counters
Built-in capable	Front-breathing design lets you make the best use of space by installing your appliance under the counter
Panel-ready door	Customize this unit using the included 2-piece bracket system (panel size: 23.4" W x 28.38" H at 3/4" thick and 10 lbs. maximum)
Easy panel installation with included 2-piece bracket kit	Enhanced panel execution allows the unit to be flush with cabinets
Stainless steel door	Fully finished door also allows you to choose a traditional stainless steel front if not installing an overlay panel
Fully articulating hinge	European style hinge design ensures a flush fit and allows for a smoother opening
Frost-free operation	No-frost operation for minimum user maintenance

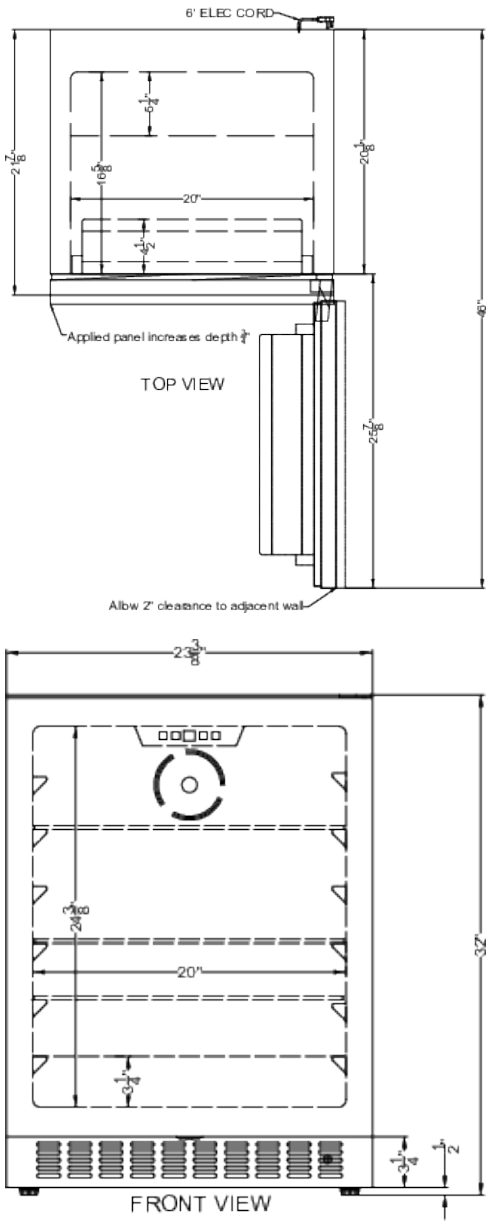
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SUMMIT

AL54PNR Specifications:

Overview	
Nominal Height	32.0" (81 cm)
Height of Cabinet	32.0" (81 cm)
Nominal Width	24.0" (61 cm)
Width	23.38" (59 cm)
Nominal Depth	23.0" (58 cm)
Depth	22.63" (57 cm)
Depth with door at 90°	46.0" (117 cm)
Capacity	4.4 cu.ft. (125 L)
Defrost Type	Frost-Free
Door	Panel-Ready
Cabinet	Black
US Electrical Safety	ETL
Canadian Electrical Safety	ETL-C
Energy Usage/Year	270.0kWh/year
Amps	1.0
Voltage/Frequency	115 V AC/60 Hz
Weight	100.0 lbs. (45 kg)
Parts & Labor Warranty	1 Year
Compressor Warranty	5 Years
UPC	761101151267
Refrigerator Features	
Sabbath Mode	Yes
Door Swing	RHD
Reversible	Yes
Shelf Type	Glass
Shelf Qty	3
Full Door Shelf Qty	2
Adjustable Shelves	Yes
Thermostat Type	Digital
Fan Type	Interior and Exterior
Refrigerant Type	R600a
Refrigerant Amount	0.99oz.
High Side PSI	270.0
Low Side PSI	105.0
Level Legs Qty	4
Interior Light	Yes
Temperature Range	36 to 43ºF

Sound Level	33.3dB
Dimensions	
Interior Height	24.38" (62 cm)
Interior Width	20.0" (51 cm)
Interior Depth	16.63" (42 cm)
Compressor Step Height	3.25" (8 cm)
Compressor Step Width	20.0" (51 cm)
Compressor Step Depth	5.25" (13 cm)



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 43-48 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 49 Quantity: 2
Manufacturer: SUMMIT
Model: ADFD2D24
Description: REACH-IN U/C FREEZER

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: ____1____ KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
Undercounter all-freezer, 3.5 cu.ft. interior, 2-drawer design, built-in or freestanding use, indoor/outdoor compatible, ADA compliant (32" high), adjustable height, stainless steel handles, stainless steel/panel ready drawer fronts, anti-slam drawers, fully finished stainless steel cabinet, removable sliding chrome basket, digital controls, LED Lighting in both compartments, sealed back, right angle plug, frost-free operation, internal fan-forced cooilng, high/low temperature alarms, open drawer alarms, temperature memory function, energy star, sabbath mode, eco-friendly R600a refrigerant, matching refrigerator (ADRD24), 115V/60 Hz, 1 amp, cETLus, ETL-Sanitation, ENERGY STAR, ADA compliant, (Commercial-Residential)

Reviewer's Stamp:

ADFD2D24PNR



32" x 23.38" x 22.75" (H x W x D)

Commercially listed ENERGY STAR certified 2-drawer frost-free freezer in stainless steel designed for indoor or outdoor use under standard or ADA compliant counters

Highlights:

32" height for use under lower ADA compliant counters

Panel-ready drawers allow you to customize the look to match existing cabinetry

Weatherproof construction ensures safe use outdoors

Product Features:

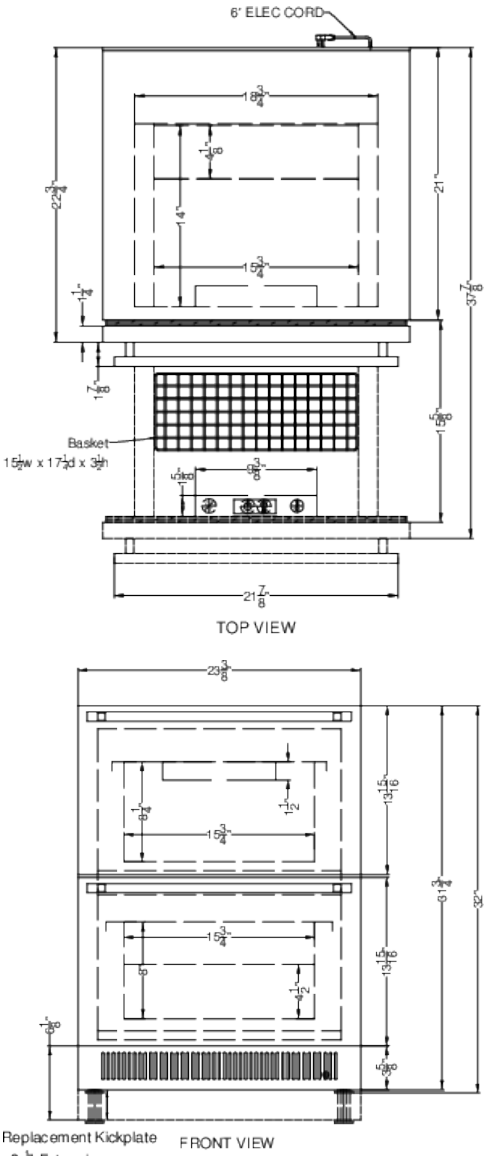
2-Drawer All-Freezer	24" wide 3.5 cu.ft. undercounter frost-free freezer with two gliding drawers
ENERGY STAR certified	Ensures unit runs efficiently with an environmentally friendly performance
Panel-ready drawer fronts	Drawers can be customized with overlay panels to match or accent existing cabinetry (panel dimensions: 23.34" W x 13.93" D at 3/4" thick)
Stainless steel finish	Fully finished drawer fronts also allows you to choose a traditional stainless steel front if not installing overlay panels
Indoor/Outdoor compatible	Durable, weatherproof construction designed to hold up to the elements
Commercially approved	ETL-S listed to NSF-7 standards for commercial use
ADA compliant	32” height allows for installation within ADA-compliant spaces
Stainless steel construction	Complete 304 grade stainless steel construction provides durability while maintaining an elegant look
Adjustable height	Unit can be raised to 34.5", with a taller kickplate included for a seamless look

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SUMMIT

ADFD2D24PNR Specifications:

Overview	
Nominal Height	32.0" (81 cm)
Height of Cabinet	32.0" (81 cm)
Nominal Width	24.0" (61 cm)
Width	23.38" (59 cm)
Nominal Depth	23.0" (58 cm)
Depth	22.75" (58 cm)
Depth with Handle	24.63" (63 cm)
Depth with door at 90°	37.88" (96 cm)
Capacity	3.5 cu.ft. (99 L)
Defrost Type	Frost-Free
Door	Panel-Ready
Cabinet	Stainless Steel
US Electrical Safety	ETL
Canadian Electrical Safety	ETL-C
Sanitation	ETL-S
Energy Usage/Year	355.0kWh/year
Amps	1.0
Voltage/Frequency	115 V AC/60 Hz
Weight	95.0 lbs. (43 kg)
Parts & Labor Warranty	1 Year
Compressor Warranty	5 Years
UPC	761101089027
Freezer	
Door Swing	Drawer
Height Adjustable	Yes
Thermostat Type	Digital
Interior Light	Yes
Fan Type	Interior and Exterior
Refrigerant Type	R600a
Refrigerant Amount	1.79 oz.
High Side PSI	320.0
Low Side PSI	120.0
Level Legs	4
Interior Height - Drawer 1	8.0" (20 cm)
Interior Width - Drawer 1	15.75" (40 cm)
Interior Depth - Drawer 1	14.0" (36 cm)
Interior Height - Drawer 2	8.25" (21 cm)
Interior Width - Drawer 2	15.75" (40 cm)
Interior Depth - Drawer 2	14.0" (36 cm)
Compressor Step Height	4.5" (11 cm)
Compressor Step Width	15.75" (40 cm)
Compressor Step Depth	4.13" (10 cm)
Temperature Range	-11°F to +10°F(-24°C to -12°C)



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 50 Quantity: 1
Manufacturer:
Model:
Description: DESSERT COUNTER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐
Hot Water	½"	☐	3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 51 Quantity: 1
Manufacturer:
Model:
Description: BEVERAGE COUNTER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 52 Quantity: 1
Manufacturer: R&D BY PIPER
Model: CUSTOM
Description: HOT & COLD ISLAND

Electrical Requirements:

120 Volt	☐	120/208 Volt	☒
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☒ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☒ Floor Sink ☒
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
SEE SHOP DRAWINGS

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 53 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 54 Quantity: 1
Manufacturer: SUMMIT
Model: AL54PNR
Description: U/C REFRIGERATOR

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 0.8 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3		X	
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
All-Refrigerator, 24" wide, 5.1 cu.ft, black exterior, counter height dimensions, height adjustable, leg shield included, panel ready door, flat door liner, right swing door, automatic defrost, interior light on rocker switch, black interior, removable crisper drawer, (3) adjustable glass shelves, bottle shelf included, 2 level legs, dial controls, quiet operation, R600a hydrocarbon refrigerant, CARB compliant, 100% CFC free, 115v/60/1-ph, ETL, ETL-C, (Residential)

Reviewer's Stamp:

AL54PNR



32" x 23.38" x 22.63" (H x W x D)

Built-in undercounter ADA compliant all-refrigerator with panel-ready door, black cabinet, door storage, and digital controls

Highlights:

32" height fits under lower ADA compliant counters

Flexible design allows built-in or freestanding use in 24" wide spaces

Customizable door front accepts full overlay panels for a seamless look that can blend into cabinetry

Product Features:

24" Wide ADA Height All-Refrigerator	Panel-ready refrigerator sized at 32" high for built-in installation under ADA compliant counters
Custom style	Door accepts overlay panel, allowing you to seamlessly blend the refrigerator into your space
ADA compliant design	32" height allows easy installation under lower ADA compliant counters
Built-in capable	Front-breathing design lets you make the best use of space by installing your appliance under the counter
Panel-ready door	Customize this unit using the included 2-piece bracket system (panel size: 23.4" W x 28.38" H at 3/4" thick and 10 lbs. maximum)
Easy panel installation with included 2-piece bracket kit	Enhanced panel execution allows the unit to be flush with cabinets
Stainless steel door	Fully finished door also allows you to choose a traditional stainless steel front if not installing an overlay panel
Fully articulating hinge	European style hinge design ensures a flush fit and allows for a smoother opening
Frost-free operation	No-frost operation for minimum user maintenance

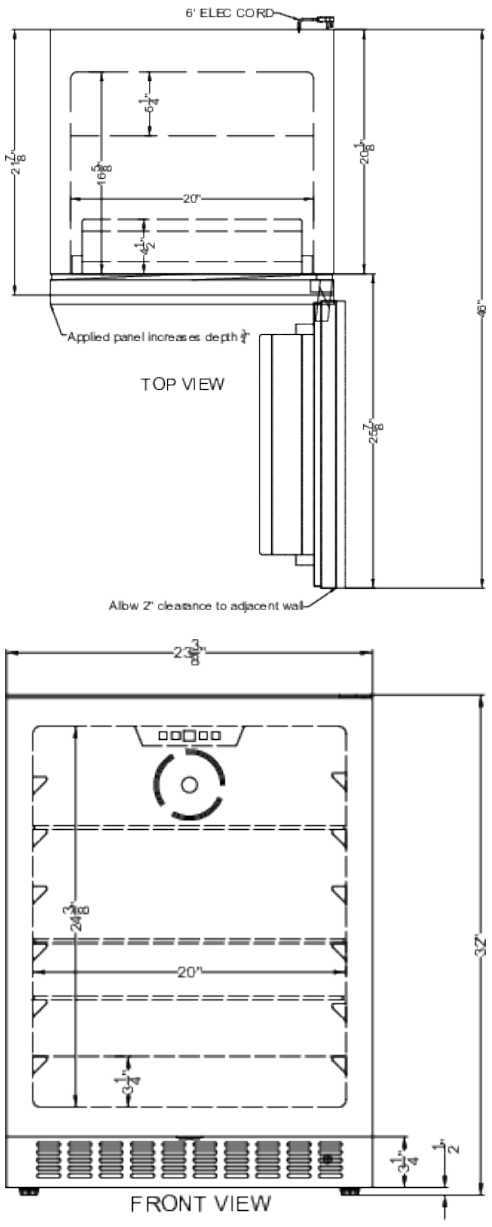
SUMMIT APPLIANCE DIVISION, FELIX STORCH, INC. | ISO 9001:2015 Certified
770 Garrison Avenue Bronx, NY 10474 USA **TEL** 718-893-3900 **FAX** 844-478-8799 info@summitappliance.com **www.summitappliance.com**

SUMMIT

AL54PNR Specifications:

Overview	
Nominal Height	32.0" (81 cm)
Height of Cabinet	32.0" (81 cm)
Nominal Width	24.0" (61 cm)
Width	23.38" (59 cm)
Nominal Depth	23.0" (58 cm)
Depth	22.63" (57 cm)
Depth with door at 90°	46.0" (117 cm)
Capacity	4.4 cu.ft. (125 L)
Defrost Type	Frost-Free
Door	Panel-Ready
Cabinet	Black
US Electrical Safety	ETL
Canadian Electrical Safety	ETL-C
Energy Usage/Year	270.0kWh/year
Amps	1.0
Voltage/Frequency	115 V AC/60 Hz
Weight	100.0 lbs. (45 kg)
Parts & Labor Warranty	1 Year
Compressor Warranty	5 Years
UPC	761101151267
Refrigerator Features	
Sabbath Mode	Yes
Door Swing	RHD
Reversible	Yes
Shelf Type	Glass
Shelf Qty	3
Full Door Shelf Qty	2
Adjustable Shelves	Yes
Thermostat Type	Digital
Fan Type	Interior and Exterior
Refrigerant Type	R600a
Refrigerant Amount	0.99oz.
High Side PSI	270.0
Low Side PSI	105.0
Level Legs Qty	4
Interior Light	Yes
Temperature Range	36 to 43ºF

Sound Level	33.3dB
Dimensions	
Interior Height	24.38" (62 cm)
Interior Width	20.0" (51 cm)
Interior Depth	16.63" (42 cm)
Compressor Step Height	3.25" (8 cm)
Compressor Step Width	20.0" (51 cm)
Compressor Step Depth	5.25" (13 cm)



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P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 55 Quantity: 1
Manufacturer: SCOTSMAN
Model: MC0530MR-1
Description: ICE MAKER

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 16.2 KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"	X	¾"		
Hot Water	½"		3/4"		

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [X] Floor Sink [X]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
Prodigy ELITE® Ice Maker, cube style, air-cooled, no condenser (remote), production capacity up to 500 lb/24 hours at 70°/50° (400 lb AHRI certified at 90°/70°), medium cube size, ICELINQ® mobile app, Bluetooth® connectivIty, preservation mode, external bin full indicator, AutoAlert™ indicating lights, WaterSense adjustable purge control, one-touch cleaning, harvest assist, unit specific QR code, stainless steel finish, AgION™ antimicrobial protection, 115v/60/1-ph, 16.2 amps, cULus, NSF, engineered and assembled in USA 1 ea NOTE: Sale of this product must comply with Scotsman's MSRP Policy; contact your Scotsman representative for details 1 ea 3 year parts & labor warranties 1 ea 5 year parts & labor warranties on Evaporator 1 ea 5 year parts on compressor & condenser 1 ea Everpure Model EV932401 Insurice® Water Filtration System, Insurice® Single-i2000², Single, (1) i2000² Micro-Pure® II Precoat primary filtration cartridge, reduces chlorine, taste & odor, inhibits scale, outlet pressure gauge, flushing

Reviewer's Stamp:

MC0530 - 500lb Cube Ice Machine

Prodigy ELITE® Modular Cube Ice Machine



Compatible with ICELINQ®



The ICELINQ® app simplifies interaction with machine via Bluetooth® connection



Intelligent sensor technology maximizes efficiency and lowers operating costs

ENHANCED RELIABILITY

Integrated ICELINQ® App
Provides real-time diagnostics, access to settings and guided cleanings. The app also contains specific information for convenient maintenance.

Upgraded Sensors
Ice thickness and water sensor design enhances cleanability and amplifies durability.

Preservation Mode
Maximizes uptime and notifies users of potential issues.

EASE OF USE

AutoAlert™ Panel
The AutoAlert™ panel displays relevant machine status that is visible across the room. Now featuring an external bin full indicator light and easier to read 16-segment display.

SANITARY DESIGN

Removable, External Air Filters
Speeds up cleaning process and reduces unit footprint.

WaterSense Adaptive Purge
Optimizes water consmption, keeping the machine cleaner and operating more efficiently.

24 Hour Volume Production

Air Cooled			Remote			Water Cooled		
70°F/21°C 50°F/10°C	Air	90°F/32°C 70°F/21°C	70°F/21°C 50°F/10°C	Air	90°F/32°C 70°F/21°C	70°F/21°C 50°F/10°C	Air	90°F/32°C 70°F/21°C
	Water			Water			Water	
476/216 lb/kg		370/168 lb/kg	500/227 lb/kg		400/181 lb/kg	507/230 lb/kg		371/168 lb/kg

Modular Bin Options



Model Number*	Dimensions W" x D" x H"	Bin Application Capacity lb/kg	Finish	Ship Weight lb/kg
B330P	30 x 34 x 36	344/156	Poly	130/59
B530S or P	30 x 34 x 50	536/244	Metallic or Poly	150/68

* Contact Scotsman for bin top requirements.

Cube Ice

Common ice form, ideal for mixed drinks.



Small Cube
7/8" x 7/8" x 3/8"
(2.22 x 2.22 x .95 cm)



Medium Cube
7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)

Certification

- ALI CERTIFIED
- REVIT BY Scotsman
- Bluetooth
- DESIGNED ENGINEERED ASSEMBLED IN THE USA
- ENERGY STAR
- ICELINQ
- CERTIFIED ISO 9001:2015
- agion Nature's antimicrobial
- c UL us
- NSF

Warranty

- 3 Years parts and labor on all components.
- 5 Years parts and labor on the evaporator.
- 5 Years parts on the compressor and condenser.
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

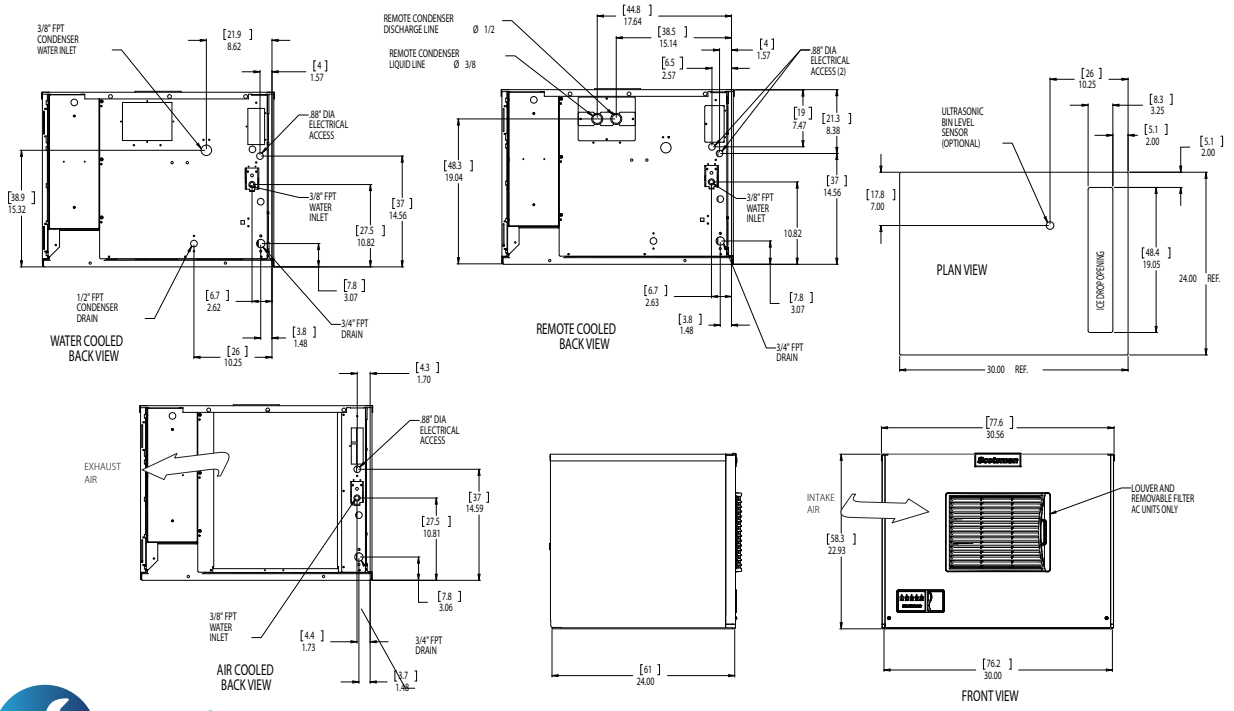
MC0530 - 500lb Cube Ice Machine

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MC0530 - 500lb Cube Ice Machine

Prodigy ELITE® Modular Cube Ice Machine

MC0530 - 500lb Cube Ice Machine



Specifications

Model Number Cube Size: medium or small	Condenser Unit	Basic Electrical Volts/Hz/Phase	Max. Fuse Size or HACR Circuit Breaker (amps)	Circuit Wires	Min. Circuit Ampacity	Energy Consumption kWh/100 lb (45.4 kg) 90°F(32°C)/70°F(21°C)	Water Usage Gallons/100 lb (liters/45.4 kg) Potable 90°F(32°C)	Water Usage Gallons/100 lb (liters/45.4 kg) Condenser 70°F(21°C)
med. MC0530MAX-1	Air	115/60/1	15	2	11.1	4.75	18.7/70.8	-
MC0530MR-1	Remote	115/60/1	20	2	16.2	6.50	18.0/68.1	-
MC0530MWX-1	Water	115/60/1	15	2	9.5	3.86	16.5/62.3	154.0/583.7
MC0530MAX-32	Air	208-230/60/1	15	2	5.9	4.75	18.7/70.8	-
sm. MC0530SAX-1	Air	115/60/1	15	2	11.1	4.75	18.7/70.8	-
MC0530SR-1	Remote	115/60/1	20	2	16.2	6.50	18.0/68.1	-
MC0530SWX-1	Water	115/60/1	15	2	9.5	3.86	16.5/62.3	154.0/583.7
MC0530SAX-32	Air	208-230/60/1	15	2	5.9	4.75	18.7/70.8	-

All Models

Dimensions (W x D x H):

Unit: 30" x 24" x 23" (76.2 x 61.0 x 58.4 cm)

Shipping Carton: 33.5" x 27.5" x 28" (85.1 x 69.9 x 71.1 cm)

Shipping Weight: 175 lb / 80 kg

BTUs per hour: 7,900

Model Number	Refrigerant	Refrigerant Charge (oz)
MC0530MAX	R290	6.5
MC0530SAX	R290	6.5
MC0530MWX	R290	5.25
MC0530SWX	R290	5.25
MC0530MR	R-404A	160
MC0530SR	R-404A	160

Accessories

Model Number	Description
KVS	Vari-Smart™ Ice Level Control - Precisely control ice levels using ultrasonic technology.
KBILC	Basic Ice Level Control - Thermistor technology, ideal for dispenser applications.
KSBU	Smart-Board™ Advanced Control - Use additional operational data for fast diagnosis.
KSBU-N	Smart-Board™ Advanced Control with Network - Network capable.
KPAS	Prodigy Advanced Sustainability Kit - Includes KVS and KSBU - N
ERC111-1	Remote condenser for MC0530xR, 115/60/1 - Consult remote condenser spec sheet for details.
BRTE10	10ft (3.0 m) line set, brazing required
BRTE25	25ft (7.6 m) line set, brazing required
BRTE40	40ft (12.2 m) line set, brazing required
BRTE75	75ft (22.9 m) line set, brazing required
XR-30	XSafe® Sanitation System for Modular Cube - Continuous operation, field-installed.

Scotsman recommends all ice machines have water filtration. See Scotsman water filter specification sheet for details.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Remote Cond. Temps	-20°F (-29°C)	120°F (49°C)
Potable Water Pressure	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)
Cond. Water Pressure	20 PSIG (1.4 bar)	230 PSIG (16.1 bar)
Electrical Voltage	-5%	+10%

Specifications and design are subject to change without notice.

101 Corporate Woods Parkway, Vernon Hills, IL 60061
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Scotsman®

EV9324-01

Insurice Single-i2000² System

Delivers premium quality water for ice applications



Insurice Single-i2000² System: EV9324-01

i2000² Replacement Cartridge: EV9612-22

BENEFITS

Reduces water-related ice machine problems caused by scale build-up from dirt and dissolved minerals

New and improved Micro-Pure II media inhibits the growth of bacteria

Reduces chlorine taste and odor and other offensive contaminants

Self-contained scale inhibitor feed keeps ice machines functioning at full capacity

Reduces maintenance and service costs by reducing scale and clogging of distribution lines, evaporator plate and pump

Precoat submicron technology reduces dirt and particles as small as 1/2 micron in size and reduces possible health contaminants such as cysts

Sanitary cartridge replacement is simple, quick and clean. Internal filter parts are never exposed to handling or contamination

NSF Certified under NSF/ANSI Standards 42 and 53

INSTALLATION TIPS

Choose a mounting location suitable to support the full weight of the system when operating

Never use saddle valve for connection

Use 3/8" water line

Do not connect system to water-cooled condenser

Install vertically with cartridges hanging down and allow 2-1/2" clearance below the cartridge for easy cartridge replacement

Flush cartridges by running water through system for five minutes at full flow

OPERATION TIPS

Change cartridges on a regular 6 month preventative maintenance program

Change cartridges when capacity is reached or when pressure falls below 10 psi

Service flow rate must not exceed 1.67 gpm

Always flush the filter cartridge at time of installation and cartridge change

APPLICATION/SIZING

For ice machine applications

Most cubers up to 750 lbs./day

Most flakers up to 1,500 lbs./day

Rated Capacity: 9,000 gallons

Insurice Single-i2000² System

SPECIFICATIONS

Overall Dimensions:
27.38"H x 6"W x 4"D

Inlet connection: 3/8"

Outlet connection: 3/8"

Service Flow Rate:
Maximum 1.67 gpm (6.3 Lpm)

Rated Capacity: 9,000 gallons

Pressure Requirements:
10 - 125 psi (0.7 – 8.6 bar), non-shock

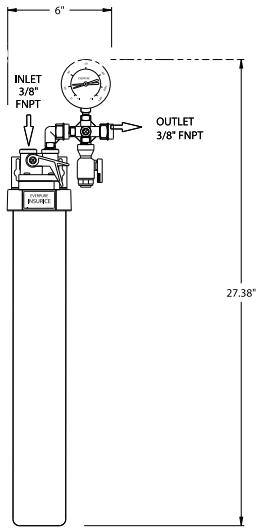
Temperature: 35 - 100°F (2 - 38°C)

No electrical connection required

Shipping Weight: 6 lbs.

Operating Weight: 9 lbs.

The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used with disinfected water that may contain filterable cysts.



WARRANTY

Everpure water treatment systems (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Everpure will provide a copy of the warranty upon request.

INDEPENDENTLY NSF CERTIFIED

System Tested and Certified by NSF International against NSF/ANSI Standard 42 and 53 for the reduction of:

Standard No. 42: Aesthetic Effects
- Chemical Unit
  - Taste and Odor Reduction
  - Chlorine Reduction
- Mechanical Filtration Unit
  - Particulate Reduction, Class I: 99.9+% reduction of particles one-half micron and larger in size

Standard No. 53: Health Effects
- Mechanical Filtration Unit
  - Turbidity Reduction
  - Cyst Reduction
  - Asbestos Reduction

EVERPURE®

EVERPURE, LLC
1040 Muirfield Drive
Hanover Park, Illinois 60133
Toll Free (800) 323-7873
Tel (630) 307-3000
Fax (630) 307-3030
http://www.everpure.com

In Europe:
N.V. EVERPURE (EUROPE) S.A.
Industriepark Wolfstee
Toekomstlaan 30
B-2200 Herentals
Belgium
Tel 32 -14-283500
Fax 32-14-283505

In Japan:
EVERPURE JAPAN LLC
Hashimoto MN Bldg. 7F
3-25-1 Hashimoto Sagamihara-Shi
Kanagawa 229-1103
Japan
Tel 81-(0)42-775-3011
Fax 81-(0)42-775-3015

Everpure, LLC
1040 Muirfield Drive
Hanover Park, IL 60133
Ph: 630-307-3000 Fax: 630-307-3030

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 56 Quantity: 1
Manufacturer:
Model:
Description: SODA DISPENSER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 57 Quantity: 1
Manufacturer:
Model:
Description: COFFEE GRINDER/BREWER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 58 Quantity: 1
Manufacturer:
Model:
Description: JUICE DISPENSER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 59 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 60 Quantity: 1
Manufacturer: PIPER
Model: CUSTOM
Description: DROP-IN HOT

Electrical Requirements:

120 Volt	☐	120/208 Volt	☒
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☒ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☒ Floor Sink ☒
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
SEE SHOP DRAWINGS

Reviewer's Stamp:

P.O. BOX 273
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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 61 Quantity: 1
Manufacturer: PIPER
Model: CUSTOM
Description: DROP-IN COLD

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: _____ KW: _____
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [X] Floor Sink [X]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:
SEE SHOP DRAWINGS

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 62 Quantity: 1
Manufacturer: PREMIER METAL & GLASS
Model: TMIR-A
Description: SNEEZE GUARD

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: _____ KW: _____
Phase: 1 X 3

Horse Power Requirements:

1/5		¼	
½		¾	
1 ¼		1 ½	
2		2 ½	
1/3			
1			
1 ¾			
3			

Plumbing Requirements:
Cold Water ½" ¾"
Hot Water ½" 3/4"
140 180

Waste Requirements:
Direct Indirect Floor Sink
Funnel type floor drain

Gas Requirements:
Natural LP
Size: ½" ¾" 1" 1 ¼"
BTU: _____

Steam Requirements:
Supply: ½" 1"
Return: ½" 1"

Description / Accessories:
CHOICE™ Adjustable Self-Service Sneeze Guard, double sided guard with top shelf, tempered glass with polished edges, adjustable end panels, table mount, 1" OD round stainless support posts, NSF & cULus listed 1 ea Specify Length: 130" 1 ea Black matte fine (049/80830) NSF 1 ea 3/8" Glass, max 60" span 1 ea Both end panels, standard 1 ea Ultra-Slim LED display light 4000k (Std.),

Reviewer's Stamp:

PMG | PREMIER METAL & GLASS

STYLE: TMIR-A

PROJECT NAME: _____

ITEM NUMBER: _____

QUANTITY: _____

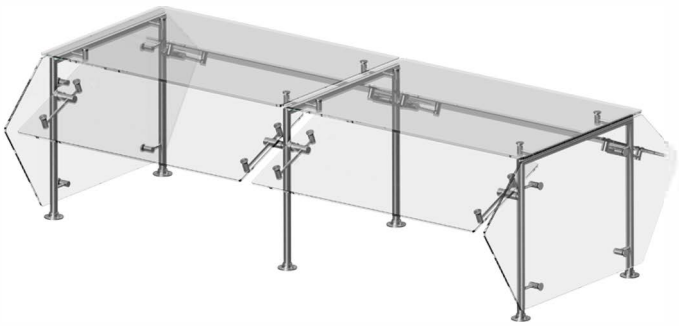
LENGTH: _____

CHOICE™

SELF SERVICE ADJUSTABLE

CHOICE™ SUPPORT:

❑ 1" OD Stainless Steel
Contact factory for additional tubing options



COMMON FINISHES:

- ❑ Brushed (#4)
- ❑ Polished (#8)
- ❑ No Smudge Silver (049/92790)
- ❑ Black Matte Fine (049/80830)
- ❑ RAL#_____
- ❑ Copper (049/63130)
- ❑ Bronze (049/66220)
- ❑ Low Light Bronze (049/61120)
- ❑ Flat Black (049/80350)
- ❑ Black Smoke Transparent (049/80375)

GLASS:

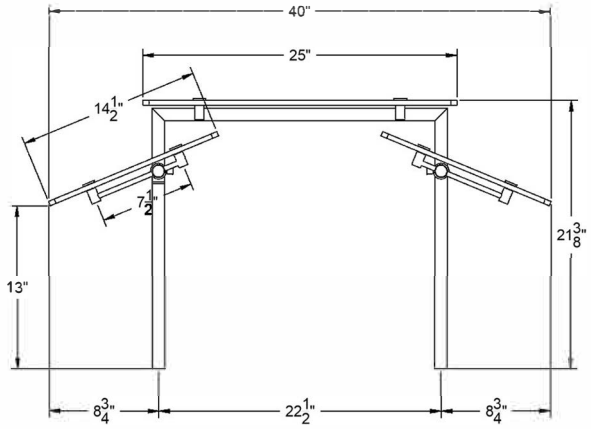
- ❑ 1/4" Glass - 48" Max. Span
- ❑ 3/8" Glass - 60" Max. Span

Contact factory for spans exceeding max.

END PANELS:

- ❑ Both (Std.)
- ❑ None
- ❑ Right Only
- ❑ Left Only

As required by NSF/ANSI 2 standards. all food shields will be quoted with side end panels unless customer requests otherwise. Standardsavailableupon request.



Advise counter thickness and material

MOUNTING OPTIONS:

Some mounting options may not be available on some cantilevered/counter substrate combinations. Refer to mounting cut-sheet or contact factory for additional information.

- ❑ 641/1 Above counter Surface Mount
- ❑ 644/1 Narrow Above counter Surface Mount
- ❑ 223 Through Counter Mount (standard when rear legs are not possible)
- ❑ 644B-3/1 Above Counter Surface Mount with Stainless Flange Cover
- ❑ Custom Mounting Options Available

ELECTRICAL COMPONENTS:

LIGHTS ONLY

❑ Ultra-Slim™ LED Display Light 4000k (Std.)
Ideal over refrigerated product areas

HEAT STRIP ONLY

❑ Hatco GRNM Narrow Max Watt Heat Lamp (Std.)
(Other Hatco heat stripsavailable)

HEAT/LIGHT COMBO

❑ Hatco GRNM Narrow Max Watt Heat Lamp and Ultra-slim™ LED Lights 4000k(Std.)(with external driver)
(other Hatco heat/combo units available)

Please see electrical cut sheet for additional options and wiring diagram.

Specifications for reference only and may be changed without notice. All orders require approved shop drawings prior to release to production. Products are drawn and built to customer specification. It is the responsibility of the customer to ensure product meets local health board standards.

WWW.PMG-INC.COM
info@pmg-inc.com
1-404-873-6000

NSF COMPONENT

UL LISTED Custom-built Food Service Equipment 4MK4

PATENT NUMBER: US 10,405,677 B2

Printed in the USA (06/2020) Premier Metal and Glass Ventures, Inc. 1835 MacArthur Blvd , NW Atlanta, GA 30318

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 63-64 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:

Cold Water	½"	☐ ¾"	☐
Hot Water	½"	☐ 3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐ 1"	☐
Return:	½"	☐ 1"	☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 65 Quantity: 1
Manufacturer: ADVANCE TABCO
Model: DTC-K70-108R
Description: DISHTABLE

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
Korner Clean Dishtable, L-shaped, attaches to right of dish machine operator, 10-1/2" backsplash, 3" rolled front & side rims, stainless steel legs, with crossrails, 107" long, 16 gauge 304 stainless steel
1 ea SPECIFY DISH MACHINE BRAND & MODEL to ensure proper fit, refer to attached document (AQ only) or consult www.advancetabco.com for compatibility listing. Certain dish machines require modifications at additional cost not shown here
1 ea Model K-495 Turn Down Backsplash (includes wall clips)
3 ea Model DTA-99B Sink Bowl, 20"W x 20"D x 12" deep, welded into top, (per bowl) (must specify sink location)
3 ea Model K-470 Sink bowl depth modification (14" maximum - specify depth required) (per bowl)
3 ea Model K-5 Drain, twist operated, 2" NPT & 1-1/2" IPS outlet connections
3 ea Model K-4 Support Bracket, for lever waste drain handle, (1) support required for each lever drain
1 ea Model DTA-88-SLANT Provision for table mounted (slant) solid sorting shelf (cantilevered from backsplash)
1 ea Model DT-6R-14 Sorting Shelf, wall mounted, traditional design, 82"W, accommodates (4) full size dish racks, solid end brackets, stainless steel, NSF
1 ea Model CUSTOM Close off rear of splash behind 3-comp sink

Reviewer's Stamp:

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

DISHTABLES
ISLAND CLEAN

Item #: _____ Qty #: _____
Model #: _____
Project #: _____

NEW *Tile Edge Design*



SPEC-LINE
DTC-G70-60R Shown

Spec-Line: 14 ga. 304 Series Stainless Steel Top.
16 ga. 304 Stainless Steel Legs Stainless Steel Legs with Welded Cross Bracing & Stainless Steel Bullet Feet.

UPGRADED!
Standard: 16 ga. 304 Series Stainless Steel Top.
16 ga. 304 Stainless Steel Legs Stainless Steel Legs with Welded Cross Bracing & Stainless Steel Bullet Feet.

FEATURES:

Tile edge for ease of installation.

Dishtable system consists of SOIL and CLEAN sections.

Table is furnished with 10-1/2" splash with a 2" return.

CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Stainless Steel Gussets welded to a stainless steel support channel.

Optional Stainless Steel UNDERSHELF
Die Cast LEG CLAMP
secured to shelf eliminates unsightly nuts & bolts



10-1/2" EXTRA LARGE Bold Looking Backsplash with 2" return and tile edge



ACCESSORIES	Model #	Qty
Undershelf		
Wall Shelf		

		14 Gauge 304 (16 Ga. Stainless Steel Legs)	16 Gauge 304 (Stainless Steel Legs)	
Nominal Size	"L"	SPEC-LINE	STANDARD	Approx. Wt.
4 Ft.	47"	DTC-G30-48L or R	DTC-G70-48L or R	145 lbs.
5 Ft.	59"	DTC-G30-60L or R	DTC-G70-60L or R	165 lbs.
6 Ft.	71"	DTC-G30-72L or R	DTC-G70-72L or R	190 lbs.
7 Ft.	83"	DTC-G30-84L or R	DTC-G70-84L or R	205 lbs.
8 Ft.	95"	DTC-G30-96L or R	DTC-G70-96L or R	215 lbs.
9 Ft.	107"	DTC-G30-108L or R	DTC-G70-108L or R	310 lbs.
10 Ft.	119"	DTC-G30-120L or R	DTC-G70-120L or R	340 lbs.
12 Ft.	143"	DTC-G30-144L or R	DTC-G70-144L or R	360 lbs.

Nominal sizing on all dishtables for ease of installation.

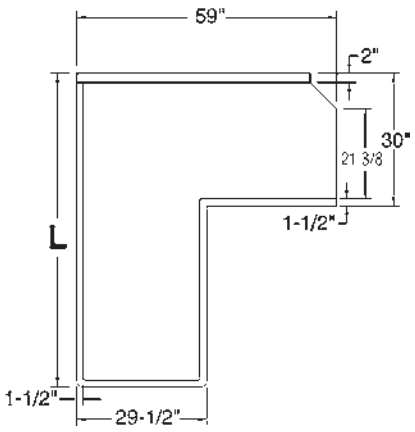
DIMENSIONS and SPECIFICATIONS

TOL ± .500"

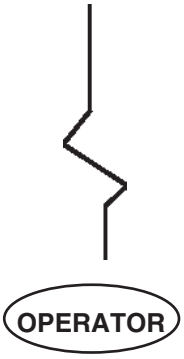
ALL DIMENSIONS ARE TYPICAL

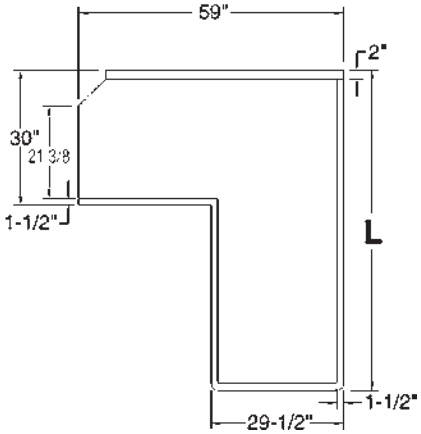
SEE DISH MACHINE COMPATIBILITY CHART TO ENSURE PROPER FIT

Dish Machine Compatibility Chart can be found on our website at www.advancetabco.com under "Product Support"

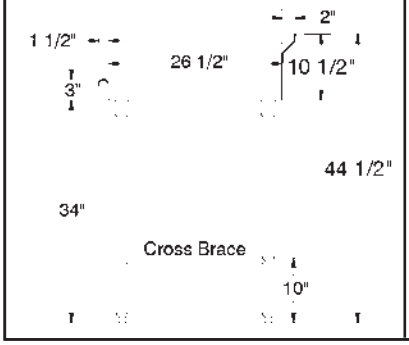
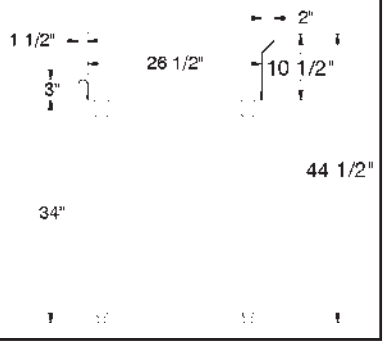


ISLAND CLEAN LEFT



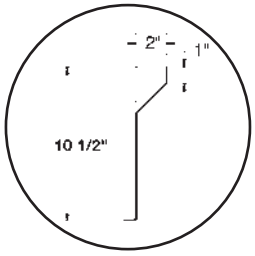


ISLAND CLEAN RIGHT

SPEC-LINE & STANDARD	SUPER SAVER
	

CUSTOMIZE YOUR OWN SYSTEM
by Ordering Optional Accessories from our
PRODUCT & PRICE GUIDE

Splash Detail



Description	SPEC-LINE	STANDARD
Material	**14 Ga. 304 Series**	**16 Ga. 304 Series**
1 5/8" Dia. Legs	Stainless Steel	Stainless Steel
Gussets	Stainless Steel	Stainless Steel
Bullet Feet (1" adj.)	Stainless Steel	Stainless Steel
Cross Bracing	Welded	Welded

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, NOVEMBER 2024

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 66 Quantity: 1
Manufacturer: CHAMPION
Model: DH-6000-VHR
Description: DISHWASHER

Electrical Requirements:

120 Volt	[ ]	120/208 Volt	[ ]
208 Volt	[ ]	208/240 Volt	[X]
220 Volt	[ ]	480 Volt	[ ]

Amps: _____ KW: _____
Phase: 1 [ ] 3 [X]

Horse Power Requirements:

1/5	[ ]	¼	[ ]	1/3	[ ]		
½	[ ]	¾	[ ]	1	[ ]		
1 ¼	[ ]	1 ½	[ ]	1 ¾	[ ]		
2	[X]	2 ½	[ ]	3	[ ]		

Plumbing Requirements:

Cold Water	½"	[ ]	¾"	[X]
Hot Water	½"	[ ]	3/4"	[ ]

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [X] Floor Sink [X]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"	[ ]	1"	[ ]
Return:	½"	[ ]	1"	[ ]

Description / Accessories:
Genesis Dishwasher, door type, 29-1/2"W, ventless heat recovery system, high temperature sanitizing with built-in electric booster heater for 70° rise, field convertible from straight through to corner, field convertible from three phase to single phase, auto start when hood is closed, single point electrical connection, door interlock switch, on-board service diagnostics, 2 HP self draining pump & motor, NSF approved (40) racks per hour, Rinse Sentry feature, automatic tank fill, detergent/chemical connections, interchangeable upper & lower spray arms, cold water feed only, automatic drain valve, lighted bottom mounted HMI controls, mounted water PRV, NSF, cULus, ENERGY STAR® 1 ea 1 year parts & labor warranty, standard 1 ea Complimentary factory authorized performance test included, upon equipment start-up. Consult local Champion sales representative for coordination of the start-up. 1 ea Single-point electrical connection, standard 1 ea 208-240v/60/3-ph 1 ea Straight-through design application 1 ea Model 421926 Drain Water Tempering Kit (unmounted if pumped drain option is chosen) 1 ea Model 418953 Shock Arrestor (unmounted) 1 ea Everpure Model EV979911 KleenWare Water Filtration System, KleenWare HTS-11, Single, (1) HT-10 HydroBlend™ scale inhibitor cartridge, 15.0 gpm, 3/4" inlet, 3/4" outlet, up to 200 psi (EV979911)

Reviewer's Stamp:

Champion®
The Dishwashing Machine Specialists

Project _____
Item No. _____
Quantity _____

DH-6000 WITH HEAT RECOVERY

DH-6000

with Ventless Heat-Recovery and Condensate Removal

STANDARD FEATURES

- **Factory Authorized Startup**
- **Ventless Heat Recovery**
- **HMI – Operator Touch Screen Interface**
- **On-Board Service Diagnostics**
- **Field Convertible – three to single phase**
- **Sleep Programable – All internal heaters shut off after selected time is reached**
- **Door Interlock – locks door closed during cycle**
- Built-in booster configured to ensure 180° rinse
- Field convertible from straight to corner operation
- Dual NSF listed as both a dishwasher and potwasher
- Rinse Sentry – ensures 180°F final rinse
- Auto start – starts unit when hood is closed
- Single or dual point electrical connection
- High efficiency 2 HP pump
- Self draining pump
- Automatic tank fill
- Automatic drain valve – drains wash tank when power is off
- PRV (Mounted Pressure Reducing Valve)
- 4 selectable cycles

Ventless Heat Recovery Condensate Removal



OPTIONS & ACCESSORIES

- ☐ ***NEW*** Built in detergent and rinse aid pumps
- ☐ Drain Water Tempering Kit (unmounted)
- ☐ Racks
  - ☐ Peg
  - ☐ Flat
- ☐ Corner operation splash baffle
- ☐ ***NEW*** Champion ION scale prevention system

Photo is for general visual representation only. Please refer to specifications for the latest detailed product information.

SPECIFIER STATEMENT

Specified unit will be Champion model DH-6000 with Ventless Heat-Recovery and Condensate Removal, high temperature hood-type dishwashing machine. Features HMI controls, Rinse Sentry, Auto start, up to 40 racks/hour, 0.73 US gals/rack [2.76 liters/rack, 0.61 imp. gals/rack].

1 year parts and labor warranty.

Champion Industries, Inc.
3765 Champion Blvd., Winston-Salem, NC 27105
Tel: 336/661-1556 Fax: 336/661-1979

2674 N. Service Road
Jordan Station, Ontario, Canada L0R 1S0
Tel: 800/263-5798 Fax: 905/562-4618

www.ChampionIndustries.com

4/19 Printed in U.S.A.

DH-6000

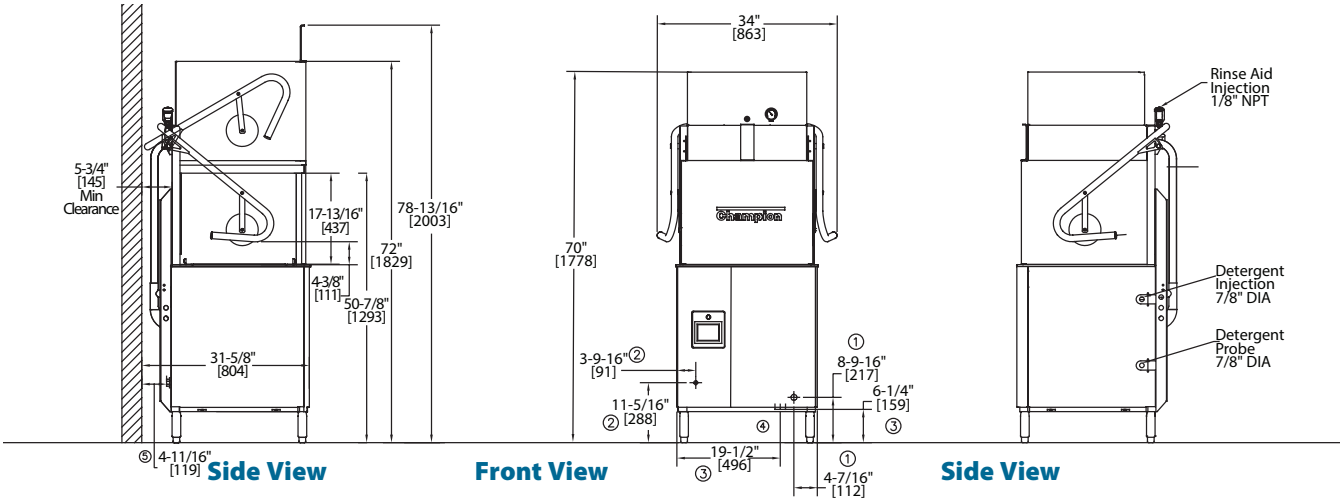
with Ventless Heat-Recovery
and Condensate Removal

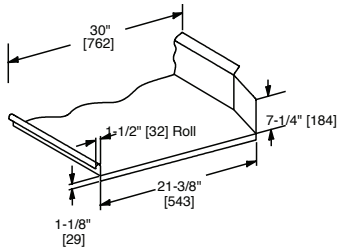
Champion®
The Dishwashing Machine Specialists

Shipping weight crated: 350 lbs.

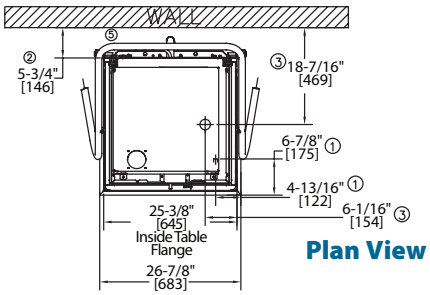
Dimensions shown in inches and [mm]

VENTLESS/HEAT RECOVERY/CONDENSATE REMOVAL

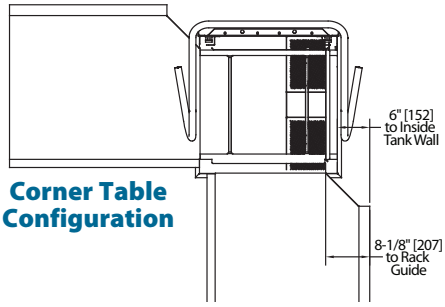




Typical Table Construction



Plan View



Corner Table Configuration

UTILITIES

1	**Electrical** Machine Connection (See Electrical Box)
2	**Cold Water** 3/4" NPT Cold Water 50° - 75°F 45 PSI Min Incoming (20-22 PSI flow)
3	**Drain** 1.5" OD Connection; 15 GPM Max Flow (Drain water tempering height 5")
4	**Drain Water Tempering** 1/2" Cold water line with customer supplied cut-off valve (optional)
5	**Integrated Detergent System** Detergent bottle supply connections (optional)

Warning: Plumbing, electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary and safety codes and the National Electrical Code.

Note: Optional Drain Tempering: 1/2" NPT cold water connection required. 1/2" NPT drain connection from back flow preventer to house drain. (FIELD INSTALLED and PLUMBED).

Due to an ongoing value analysis program at Champion, specifications contained in this catalog are subject to change without notice.

Champion Industries, Inc.,
3765 Champion Blvd., NC 27105
336/661-1556 • Fax: 336/661-1979
ChampionIndustries.com

Machine & Built-in Booster (Standard)

Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Overcurrent Protective Device
208-240/60/1	77-68	100	100
208-240/60/3	46-41	60	60
480/60/3	20	30	30

Machine Only
(two point electrical connection or no built-in booster)

Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Overcurrent Protective Device
208-240/60/1	38-34	50	50
208-240/60/3	25-23	30	30
480/60/3	11	15	15

Booster Only (two point electrical connection)

Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Overcurrent Protective Device
208-240/60/1	39-34	50	50
208-240/60/3	21-18	25	25
480/60/3	9	15	15

Note: Water Hammer Arrestor (meeting ASSE-1010 standard or equivalent) to be supplied (by others) in common water supply line at service connection.

SPECIFICATIONS

Capacities
- Racks per hr. (NSF rated) 40
- Wash tank (gal.) 10

Motor horsepower 2 HP

Water consumption
- Gal. per hr. 29
- Gal. per rack 0.73

Temperature °F
- Wash 150
- Rinse 180

Heating
- Tank heat, electric 5.2 kW
- Electric Booster 7.5 kW

	Dish-washer Mode	Pot & Pan Mode		
Selectable cycle times in minutes	1	2	4	6
Time cycles in seconds				
Wash	36	94	214	334
Rinse	8	10	10	10
Sanitary Dwell	16	16	16	16
Vent Fan	30	30	30	30
Total	**90**	**150**	**270**	**390**

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 67 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 68 Quantity: 1
Manufacturer: ADVANCE
TABCO Model: DTS-D70-84L
Description: SOILED DISHTABLE

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	X	¾"	☐			
Hot Water	½"	X	3/4"	☐			
140	☐		180	☐			

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink X Floor Sink X
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
Dishlanding-Soil Dishtable, L-shaped with landing, attaches to left of dish machine operator, 10-1/2"H backsplash, with pre-rinse sink, stainless steel legs, with crossrails, 83" long, 16/304 stainless steel
1 ea SPECIFY DISH MACHINE BRAND & MODEL to ensure proper fit, refer to attached document (AQ only) or consult www.advancetabco.com for compatibility listing. Certain dish machines require modifications at additional cost not shown here
1 ea Model K-508 Modification to reduce length, start with next largest size then add "K-508" to model number for sinks & dish tables
1 ea Specify length
1 ea Model K-495 Turn Down Backsplash (includes wall clips)
1 ea Model DTA-100 Pre-Rinse Basket with Slide Bar, for 20"W x 20"D fabricated sink bowls
1 ea Model DTA-53 Pre-Rinse Faucet, 8" OC splash-mounted, includes: spray valve & hose, riser, wall bracket, heavy duty hose spring, lead free
1 ea Model K-06 Splash Mount Faucet Mounting Kit, for K-1, K-11, K-101, K-105, K-112, K-119 & K-211 faucets
1 ea Model K-5 Drain, twist operated, 2" NPT & 1-1/2" IPS outlet connections
1 ea Model K-4 Support Bracket, for lever waste drain handle, (1) support required for each lever drain

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 69 Quantity: 1
Manufacturer:
Model:
Description: ROLL DOWN DOOR

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 70-74 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐	180	☐		

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:

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Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 75 Quantity: 1
Manufacturer:
Model:
Description: UNDERMOUNT SINK

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 76 Quantity: 1
Manufacturer:
Model:
Description: NIGHT KITCHEN COUNTER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 77 Quantity: 1
Manufacturer:
Model:
Description: NIGHT KITCHEN COUNTER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 78 Quantity: 1
Manufacturer: AMANA
Model: RMS10DSA
Description: MICROWAVE OVEN

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 13 KW: 1.5
Phase: 1 X 3

Horse Power Requirements:

1/5	¼	1/3	
½	¾	1	
1 ¼	1 ½	1 ¾	
2	2 ½	3	

Plumbing Requirements:
Cold Water ½" ¾"
Hot Water ½" 3/4"
140 180

Waste Requirements:
Direct Indirect Floor Sink
Funnel type floor drain

Gas Requirements:
Natural LP
Size: ½" ¾" 1" 1 ¼"
BTU: _____

Steam Requirements:
Supply: ½" 1"
Return: ½" 1"

Description / Accessories:
Amana® Commercial Microwave Oven, 0.8 cu. ft. capacity, 1000 watts, low volume, single stage cooking, (1) power level, lighted control dial, 6-minute max cooking time, interlock safety switch, audible end of cycle signal, side hinged door with tempered glass, LED lighted interior, stainless steel interior & exterior, 120v/60/1-ph, 13.0 amps, 15 MCA, 1500 watts (total), cord, NEMA 5-15P, cETLus, ETL-Sanitation 1 ea 3-year limited warranty (1 year full)

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 79 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:
120 Volt ☐ 120/208 Volt ☐
208 Volt ☐ 120/240 Volt ☐
220 Volt ☐ 480 Volt ☐
Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:
1/5 ☐ ¼ ☐ 1/3 ☐
½ ☐ ¾ ☐ 1 ☐
1 ¼ ☐ 1 ½ ☐ 1 ¾ ☐
2 ☐ 2 ½ ☐ 3 ☐

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 80 Quantity: 1
Manufacturer: ALLPOINTS
Model: 95232
Description: POP-UP TOASTER

Electrical Requirements:

120 Volt	X	120/208 Volt	
208 Volt		120/240 Volt	
220 Volt		480 Volt	

Amps: 15 KW: 1.8
Phase: 1 [X] 3 [ ]

Horse Power Requirements:

1/5		¼		1/3			
½		¾		1			
1 ¼		1 ½		1 ¾			
2		2 ½		3			

Plumbing Requirements:

Cold Water	½"		¾"	
Hot Water	½"		3/4"	

140 [ ] 180 [ ]

Waste Requirements:
Direct [ ] Indirect [ ] Floor Sink [ ]
Funnel type floor drain [ ]

Gas Requirements:
Natural [ ] LP [ ]
Size: ½" [ ] ¾" [ ] 1" [ ] 1 ¼" [ ]
BTU: _____

Steam Requirements:

Supply:	½"		1"	
Return:	½"		1"	

Description / Accessories:

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 81 Quantity: 1
Manufacturer:
Model:
Description: AIR FRYER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐	
Hot Water	½"	☐	3/4"	☐	
140	☐		180	☐	

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:
BY OTHERS; NIKEC

Reviewer's Stamp:

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Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 82-84 Quantity:
Manufacturer:
Model:
Description: SPARE NUMBER

Electrical Requirements:

120 Volt	☐	120/208 Volt	☐
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐	1/3	☐		
½	☐	¾	☐	1	☐		
1 ¼	☐	1 ½	☐	1 ¾	☐		
2	☐	2 ½	☐	3	☐		

Plumbing Requirements:

Cold Water	½"	☐	¾"	☐
Hot Water	½"	☐	3/4"	☐

140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:

Supply:	½"	☐	1"	☐
Return:	½"	☐	1"	☐

Description / Accessories:

Reviewer's Stamp:

P.O. BOX 273
Indianapolis, IN 46278
Phone: 317-359-3000 / Fax: 317-489-6491

Project name: ALPHA PHI
Project location: FAYETTEVILLE, AR
Project number: A25-

Item: 85 Quantity: 1
Manufacturer: KOLPAK
Model: CUSTOM
Description: WALK-IN COOLER/FREEZER

Electrical Requirements:

120 Volt	☐	120/208 Volt	X
208 Volt	☐	120/240 Volt	☐
220 Volt	☐	480 Volt	☐

Amps: _____ KW: _____
Phase: 1 ☐ 3 ☐

Horse Power Requirements:

1/5	☐	¼	☐
½	☐	¾	☐
1 ¼	☐	1 ½	☐
2	☐	2 ½	☐
1/3	☐		
1	☐		
1 ¾	☐		
3	☐		

Plumbing Requirements:
Cold Water ½" ☐ ¾" ☐
Hot Water ½" ☐ 3/4" ☐
140 ☐ 180 ☐

Waste Requirements:
Direct ☐ Indirect ☐ Floor Sink ☐
Funnel type floor drain ☐

Gas Requirements:
Natural ☐ LP ☐
Size: ½" ☐ ¾" ☐ 1" ☐ 1 ¼" ☐
BTU: _____

Steam Requirements:
Supply: ½" ☐ 1" ☐
Return: ½" ☐ 1" ☐

Description / Accessories:
SEE SHOP DRAWINGS

Reviewer's Stamp:

SECTION 13120
CELLULAR PVC CORNICE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pre-fabricated Cellular PVC cornice system.

B. Associated building elements, including parapet walls.

1.02 RELATED SECTIONS

A. Section 03300 – Cast-in-place Concrete: coordination with substrate

B. Section 05100 – Structural Metal Framing: internal framing

C. Section 05400 – Cold Formed Metal Framing: internal framing and blocking

D. Section 06100 – Rough Carpentry: internal framing and blocking

E. Section 06201 – Exterior Finish Carpentry

F. Section 10340 – Manufactured Exterior Specialties

G. Section 10345 – Exterior Specialties Restoration

H. Section 13120 – Pre-Engineered Structures

1.03 DESIGN REQUIREMENTS

A. Pre-Fabricated Cornice System shall be designed, fabricated, and installed to conform to the state codes, local codes, and the Architect's design.

B. Integral framing with concealed hanging cleats.

C. Pre-fabricated corner assemblies.

D. Replication of historic elements and profiles, as required.

E. Basis-of-Design: Cellular PVC Cornice System, as manufactured by Decoro Building Products.

1.04 SUBMITTALS

A. Product Data, including Manufacturer's literature for pre-engineered structures.

B. Shop Drawings, including dimensioned Elevations, Sections and Details.

C. Installation Instructions, showing all necessary steps to complete the installation in accordance with the Manufacturer's recommendations.

D. Samples: Submit manufacturer's samples of materials, finishes, and colors.

E. Maintenance: Submit manufacturer's maintenance Instructions

F. Warranty: Submit manufacturer's standard warranty

1.05 QUALITY ASSURANCE

A. A. Manufacturers' Qualifications

B. Not less than ten years' experience in the actual system specified.

C. Mock-Up
   1. Provide a mock-up for evaluation of design and workmanship.
   2. Mock-up must be made as the finished product will arrive on site, not including any on-site finishing, such as filling, painting, etc…
   3. Do not proceed with production until Architect has approved the mock-up.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store on site in a clean and dry location, on a flat level, surface to avoid damage.

B. Handle with care, as with any products, to avoid dropping, bumping, etc…

1.07 PROJECT CONDITIONS

A. Manufacturer to coordinate fabrication and delivery schedule with other trades to provide for an efficient sequence of work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:

B. Decoro Building Products, 68 E Dudley Town Rd, Bloomfield CT 06002

C. Phone: 1-800-676-8840, Email: connect@decoro.com

D. Substitutions: Not permitted

2.02 MATERIALS

A. Integral LG metal and plywood framing system.

B. Cornice Surface: Cellular PVC

2.03 FABRICATION

A. Manufacturer must not proceed with fabrication until shop drawings, samples and mock-ups have been approved by Architect

B. All fasteners through the finish surface must be stainless steel, and patched using two-part patching compound.

2.04 FINISHING

A. No exposed fasteners allowed after installation

B. Product must be finished in accordance with the manufacturer’s instructions

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrate has been properly prepared.

B. Fully inspect the supporting structure to verify a structurally sound, square, plumb and true base.

C. Verify that base is dimensionally accurate in accordance with approved shop drawings.

3.02 PREPARATION

A. If upon examination, base is found to be not in accordance with requirements, perform necessary remedial action.

B. Obtain approval from Architect and manufacturer before proceeding with any remedial action.

3.03 INSTALLATION

A. Install cornice system in accordance with manufacturer’s instructions and approved shop drawings.

3.04 CLEANING

A. Clean promptly after installation following manufacturer’s instructions.

3.05 PROTECTION

A. Protect installed product until completion of project.

END OF SECTION

SECTION 14 2100
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASME A17.1 - Safety Code for Elevators and Escalators; 2013.

B. ISO 9001 - Quality Management Systems-Requirements; 2008.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

F. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.02 SUMMARY

A. This section specifies electric traction elevators.

B. Work Required
   1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
   2. All work shall be performed in a first class, safe and workmanlike manner.
   3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

RELATED SECTIONS

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.
   1. Section 01 50 00 – Temporary Facilities and Controls: protection of floor openings and personnel barriers; temporary power and lighting.
   2. Section 03 30 00 – Cast-In-Place Concrete: elevator pit and elevator machine foundation.
   3. Section 04 20 00 – Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
   4. Section 05 50 00 – Metal Fabrications: pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.
   5. Section 07 16 00 – Cementitious Waterproofing: waterproofing of elevator pit.
   6. Section 23 50 00 – Heat Generation Equipment: ventilation and temperature control of elevator equipment areas.
   7. Section 26 05 00 – Common Work Results for Electrical:
      a. Main disconnects for each elevator.
      b. Electrical power for elevator installation and testing.
      c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
      d. The installation of dedicated GFCI receptacles in the pit and overhead.
      e. Lighting in controller area, machine area and pit.
      f. Wiring for telephone service to controller (if applicable).
   8. Section 26 30 00 – Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.
   9. Section 27 30 00 – Voice Communications: ADAAG-required emergency communications equipment.
   10. Section 28 31 00 – Fire Alarm Systems: fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area.
   11. Section 31 10 00 – Site Clearing: excavation for elevator pit.

REFERENCES

A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:
   1. ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
   2. ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.
   3. ADAAG, American Disabilities Act Accessibility Guidelines.
   4. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
   5. ANSI/NFPA 70, (NEC) National Electrical Code.
   6. CAN/CSA C22.1, (CEC) Canadian Electrical Code.
   7. ANSI/UL 10B, Standard for Fire Test of Door Assemblies.
   8. CAN/ULC-S104-10, Standard Method for Fire Test of Door Assemblies.
   9. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.
   10. Building Codes IBC or NBCC.
   11. All Local Jurisdictional applicable codes.

SYSTEM DESCRIPTION

A. Equipment Description: Gen3 Core™ gearless machineroom less elevator where all components fit inside the hoistway.

B. Equipment Control: Elevonic® Control System.

C. IoT Connectivity: Elevator connected to Otis ONE IoT Platform

D. Drive: Regenerative

E. Quantity of Elevators: 1

F. Elevator Stop Designations: 1, 2, 3, 4

G. Stops: 4

H. Openings: Front Only

I. Travel: 40’-0” 480 inch

J. Pit Depth: 4’-0”

K. Rated Capacity: 2100 lb (953 kg)

L. Rated Speed: 150 fpm 0.83 yard/s)

M. Laminate Cab Clear Inside Dimensions: 5’-8 5/16" Width x 4’-3 9/16” Depth 68.31 inch Width x 51.54 inch Depth)

N. Cab Height: 7’-9” 92.99 inch

O. Clear Cab Height: 7’-8 ⅛” 92.13 inch with 1 ¼” (1.26 inch) Floor Recess and 4 LED Ceiling

P. Entrance Type and Width: Single-Speed Side Opening Door – 36” 35.98 inch

Q. Entrance Height: 7’-0” 84.02 inch

R. Main Power Supply: 480 volts □ 5% of normal, three-phase, with a separate equipment grounding conductor.

S. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.

T. Machine Location: Rail-mounted at the top of the hoistway.

U. Signal Fixtures: Manufacturer’s standard with metal button targets (excluding CA).

V. Controller Location: Machine Roomless controller(s) must be jamb-mounted on the same side as the counterweight, located at the top landing.

W. Performance:
   1. Car Speed: □ 3 % of contract speed under any loading condition or direction of travel.
   2. Car Capacity: Safely lower, stop and hold up to 120% of rated load (code required).
   3. Ride Quality:
      a. Vertical Vibration (maximum): 20 milli-g

b. Horizontal Vibration (maximum): 12 milli-g
c. Vertical Jerk (maximum): 4.59 □ 1.0 feet/ sec3 (1.4 □ 0.33 yard/ sec3)
d. Acceleration/Deceleration (maximum): 2.62 feet/ sec2 (0.87 yard/ sec2)
e. In Car Noise: 55 – 60 dB(A)
f. Stopping Accuracy: □ 0.375 inch. (□ 0.39 inch) max, □ 0.25 inch. (□ 0.24 inch) Typical
g. Re-leveling Distance: □ 0.5 inch. (□ 0.47 inch)

X. Operation: Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

Y. Operation Features – Standard
1. Full Collective Operation
2. Anti-nuisance.
3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Independent Service.
6. Firefighters' Service Phase I and Phase II (USA only); or Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation (Canada only).
7. Top of Car Inspection.
8. Zoned Access at Bottom Landing.
9. Zoned Access at Top Landing

Z. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
3. Door protection shall consist of a two-dimensional or a code required, three-dimensional, multi-beam array projecting across the car door opening.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

AA. Provide equipment for seismic conditions: No

SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Manufacturer shall have a minimum of fifteen years of experience in the fabrication, installation and service of elevators.

C. Installer: Elevators shall be installed by the manufacturer.

D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

DELIVERY, STORAGE, AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

B. Should the storage area be off-site, and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

WARRANTY

A. The elevator contractor’s acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

MAINTENANCE AND SERVICE

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 Months after the elevator has been turned over for the customer’s use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs, or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components shall not be required, including Sheaves, Rails, Belts, Ropes, Car and Counterweight guides, etc.

C. The elevator control system must:
   1. Provide in the controller the necessary devices to run the elevator on inspection operation.
   2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
   3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
   4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
   5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
   6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
   7. (Optional) Provide the means from the controller to reset elevator earthquake operation.

PART 2 PRODUCTS

10.01 MANUFACTURER

A. Manufacturer: Design based upon Otis Elevator's Gen3 Core™ machine room-less elevator system.

DESIGN AND SPECIFICATIONS

A. Provide Gen3™ Core traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
   1. Controller located entirely inside the hoistway.
   2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
   3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
   4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
   5. LED lighting standard in ceiling lights and elevator fixtures.
   6. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator Company

EQUIPMENT: CONTROLLER COMPONENTS

A. Controller: A microcomputer-based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
   1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
   2. Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
   3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
   4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
   5. Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.
   6. A separate control room, space or closet is an option.

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: The governor shall be a tension type car-mounted governor.

C. Buffers, Car, and Counterweight: Polyurethane type buffers shall be used for speeds of 150 and 200 feet per minute.

D. Hoistway Operating Devices:
   1. Emergency stop switch in the pit.
   2. Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.

H. Governor Rope: Shall be steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided in accordance with code requirements.

J. Hoistway Entrances:
   1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel. The entrance profile (jamb face) shall be a width of 2 7/8” 2.87 inch.
   2. Sills shall be extruded aluminum.
   3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
   4. Fire Rating: Entrance and doors shall be UL fire rated for 1-½ hour
   5. Entrance Finish: Brushed Stainless Steel
   6. Entrance Marking Plates: Entrance jambs shall be marked with 4” x 4” 4.02 inch x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
   7. Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.

EQUIPMENT: CAR COMPONENTS

A. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

B. Cab: Laminate Cab with vertical high-pressure laminate wall panels
   1. Wall Finish: Plastic Laminate - Crisp Linen
   2. Ceiling Finish: White

C. Interior Car Door Finish: Brushed Stainless Steel

D. Exterior Door and Frame Finish: Primed to be painted. Paint color as scheduled on drawings.

E. Flush Ceiling with 4 LED Lights

F. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

G. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

H. Handrails: Provided on the side walls of the car enclosure. They shall be, 1 ½” diameter 1.5 inch Round Bar Handrail s with a Brushed Steel Finish.

I. Threshold: Extruded Aluminum

J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

K. Guides: The car shall have 3” diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom. Optional counterweight guides available.

L. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

M. The LED ceiling lights, and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.
    1. Note: Below are optional.

N. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A Standard Otis ONE™ Pro flat applied car operating panel with a surrounding injected molded bezel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a brushed stainless steel finish and include a service cabinet. (A second COP is available)
    1. The car operating panel shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:
        a. Flush Mounted brushed stainless steel buttons with white LED illuminating halos.
    2. The car operating panel shall be equipped with the following features:
        a. Raised markings and Braille to the left-hand side of each push-button.
        b. Car Position Indicator at the top of and integral to the car operating panel.
        c. Door open and door close buttons.
        d. Inspection key-switch.
        e. Elevator Data Plate marked with elevator capacity and car number.
        f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
        g. Display Screen: Include display screen located near the top of the COP. The display screen shall display the car position indicator, travel direction arrows, elevator status jewels, and provide emergency text communication.
        h. Camera: Include camera located above display screen for emergency video communication. This camera is for emergency communication only.
        i. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
    3. Note: Below are Standard for USA
        a. In car stop switch (toggle or key unless local code prohibits use)
        b. Firefighter’s hat (standard USA)
        c. Firefighter’s Phase II Key-switch (standard USA)
        d. Call Cancel Button (standard USA)
        e. Firefighter’s Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.
        f. Please Exit Symbol: provided with emergency hospital service, or express priority in the hall.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall include:
    1. Round stainless steel, mechanical buttons located in the entrance frame face mounted vertically. Fixtures shall be brushed stainless steel finish.
        a. Flush Mounted brushed stainless steel buttons with white LED illuminating halos.
    2. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound.

D. Access key-switch at top floor in entrance jamb is optional.

E. Access key-switch at lowest floor in entrance jamb is optional.

PART 3 EXECUTION

16.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

INSTALLATION

A. Installation of all elevator components except as specifically provided for elsewhere by others.

DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

NOTICE TO THE USER:

PERMISSION IS GRANTED TO USE THIS MATERIAL FOR ONLY THE PURPOSE FOR WHICH OTIS SUPPLIES IT.

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REV 07/12/2023

END OF SECTION

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.

B. Buried piping.

C. Escutcheons.

D. Mechanical couplings.

E. Pipe hangers and supports.

F. Pipe sleeves.

G. Pipe sleeve-seal systems.

H. Piping specialties.

I. Pressure gauges.

J. Pressure relief valves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 211200 - Fire-Suppression Standpipes: Standpipe design.

C. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.

E. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

F. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

G. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

H. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

I. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2024.

J. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.

K. ASME B16.25 - Buttwelding Ends; 2022.

L. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.

M. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

N. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

O. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

P. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.

Q. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

R. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

S. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

T. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

V. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

W. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

X. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

Y. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.

Z. AWWA C606 - Grooved and Shouldered Joints; 2022.

AA. FM (AG) - FM Approval Guide; Current Edition.

BB. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

CC. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2024.

DD. UL (DIR) - Online Certifications Directory; Current Edition.

EE. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

FF. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. Minimum three years experience.

C. Comply with FM (AG) and UL (DIR) requirements.

D. Valves: Bear FM (AG) and UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Combined Sprinkler, Standpipe, and Hose System:
   1. Comply with NFPA 13 and NFPA 14.
   2. See Sections 211300 and 211200.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40, ASTM A135/A135M Schedule 10, ASTM A795/A795M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1/D1.1M.
   4. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

B. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, or ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.9 wrought steel, buttwelded, ASME B16.25 buttweld ends, ASTM A234/A234M wrought carbon steel or alloy steel, ASME B16.5 steel flanges and fittings, or ASME B16.11 forged steel socket welded and threaded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc-coated or cast-iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.05 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
a. Corrosion resistant.
b. Underground, buried, and wet conditions.
5. Pressure plates: RFP or stainless steel.
6. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.06 ESCUTCHEONS

A. Material:
1. Chrome-plated.
2. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.07 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.08 MECHANICAL COUPLINGS

A. Manufacturers:
1. Anvil International: www.anvilintl.com/#sle.
2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
3. Victaulic Company: www.victaulic.com/#sle.
4. Or equal.

B. Rigid Mechanical Couplings for Grooved Joints:
1. Dimensions and Testing: Comply with AWWA C606.
2. Minimum Working Pressure: 300 psig (2065 kPa).
3. Housing Material: Fabricate of ductile iron complying with ASTM A536.

4. Housing Coating: Factory applied orange enamel.
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.09 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Double-check valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Commercial Riser Manifold: Preassembled and tested riser manifold in accordance with NFPA 13.

D. Test Connections:
   1. Combination Inspector's Test Connection and Drain Valve:
      a. Provide test connections approximately 6 feet (2 m) above floor for portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
      b. Route combination test connection and drain valve to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
      c. Supply discharge orifice with same size as corresponding sprinkler orifice.
      d. Limit vertical height of exterior wall penetration to 2 feet (0.61 m) above finished grade.
   2. Backflow Preventer Test Connection:
      a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5-inch (65 mm) National Standard male hose threads with cap and chain.
      b. Provide one valve for each 250 gpm (16 L/sec) of system demand or fraction thereof.
      c. Provide permanent sign reading "Test Valve." See Section 210553.

E. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome-plated gong and motor housing, nylon bearings, and inlet strainer.

F. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.

G. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

H. Fire Department Connections:
   1. Type: Free standing made of corrosion-resistant metal complying with UL 405.
   2. Locate per Civil Engineer.
   3. Specifications as required by local Fire Marshal.

2.10 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

2.11 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

D. Install piping to conserve building space, to not interfere with use of space and other work.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 m).
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

H. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

K. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

L. Provide sleeves when penetrating floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
   4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

M. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.

N. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 210523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Two-piece ball valves with indicators.

B. Iron butterfly valves with indicators.

C. Iron OS&Y gate valves.

D. NRS gate valves.

E. Indicator posts.

F. Trim and drain valves.

1.02 RELATED REQUIREMENTS

A. Section 210553 - Identification for Fire Suppression Piping and Equipment.

1.03 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene-propylene diene monomer.

B. NRS: Non-rising stem.

C. OS&Y: Outside screw and yoke.

D. PTFE: Polytetrafluoroethylene.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300; 2021.

D. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.

E. AWWA C606 - Grooved and Shouldered Joints; 2022.

F. FM (AG) - FM Approval Guide; Current Edition.

G. FM 1110 - Approval Standard for Indicator Posts; 1990.

H. FM 1112 - Examination Standard for Indicating Valves (Butterfly or Ball Type); 2020.

I. FM 1120/1130 - Approval Standard for Fire Service Water Control Valves (OS&Y and NRS Gate Valves); 1997.

J. FM 1140 - Approval Standard for Quick Opening Valves 1/4 Inch through 2 Inch Nominal Size; 1998.

K. UL (DIR) - Online Certifications Directory; Current Edition.

L. UL 258 - Shutoff Valves for Trim and Drain Purposes for Fire Protection Service; Current Edition, Including All Revisions.

M. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.

N. UL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.

O. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Where listed products are specified, provide products listed, certified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect valve ends and flange faces.
   3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:
   1. Use sling to handle large valves, rig to avoid damage to exposed parts.
   2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Source Limitations: Furnish valves of same kind by same manufacturer.

B. Valve-End Connections:
   1. Flanges on Iron Valves: ASME B16.1 or ASME B16.42.
   2. Threaded Ends: ASME B1.20.1.
   3. Grooved Ends: AWWA C606.

C. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

D. Valve Sizes: Same as upstream piping unless otherwise indicated.

E. Valve Actuator Types:
   1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
   2. Handwheel: For other than quarter-turn trim and drain valves.
   3. Hand-lever: For quarter-turn trim and drain valves 2 NPS (50 DN) and smaller.

2.02 TWO PIECE BALL VALVES WITH INDICATORS

A. UL 1091 and FM 1112 listed.

B. Description:
   1. Minimum Pressure Rating: 175 psig (1200 kPa).
   2. Body Design: Two piece.
   3. Body Material: Forged brass or bronze.
   4. Port Size: Full or standard.
   5. Seat: PTFE.
   6. Stem: Bronze or stainless steel.
   7. Ball: Chrome-plated brass.

8. Actuator: Worm gear or traveling nut.
9. Supervisory Switch: Internal or external.
10. End Connections: Threaded or grooved.

2.03 IRON BUTTERFLY VALVES WITH INDICATORS

A. UL 1091 and FM 1112 listed.

B. Minimum Pressure Rating: 175 psig (1200 kPa).

C. Body Material: Cast or ductile iron.

D. Seat: EPDM.

E. Stem: Stainless steel.

F. Disc: Ductile iron with EPDM coating.

G. Actuator: Worm gear or traveling nut.

H. Supervisory Switch: Internal or external.

I. Body Design: Grooved-end or wafer style.

2.04 IRON OS&Y GATE VALVES

A. UL 262 and FM 1120/1130 listed.

B. Minimum Pressure Rating: 175 psig (1200 kPa).

C. Body and Bonnet Material: Cast or ductile iron.

D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

E. Stem: Brass, bronze, or stainless steel.

F. Packing: Non-asbestos PTFE.

G. Supervisory Switch: External.

H. End Connections: Grooved.

2.05 IRON NRS GATE VALVES

A. UL 262 and FM 1120/1130 listed.

B. Minimum Pressure Rating: 175 psig (1200 kPa).

C. Body and Bonnet Material: Cast or ductile iron.

D. Wedge: Cast or ductile iron with elastomeric coating.

E. Stem: Brass or bronze.

F. Packing: Non-asbestos PTFE.

G. Operation:
1. Operating nut for post-indicating valves.
2. Handwheel for non-post-indicating valves.

H. Post Plate: Provide for post-indicating valves.

I. Supervisory Switch: External.

J. End Connections: Grooved.

2.06 INDICATOR POSTS

A. Underground Indicator Posts:
1. UL 789 and FM 1110 listed, ground-mounted indicator post for operating buried sprinkler-system isolation valves, with fixed or telescoping barrel.
2. Barrel Standpipe Material: Carbon steel or ductile iron.
3. Telescoping Top Barrel for Adjustable Length Indicator Posts: Carbon steel, cast iron, or ductile iron.
4. Post Head: Cast or ductile iron.

5. Operation: Locking wrench.
6. Finish: AWWA C550 epoxy coating.

B. Pit Indicator Posts:
1. UL 789 and FM 1110 listed, slab-mounted indicator post for operating inaccessible sprinkler-system isolation valves located in service pits, vaults, or tunnels.
2. Barrel Standpipe Material: Carbon steel or ductile iron.
3. Post Head: Cast or ductile iron.
4. Operation: Locking wrench.
5. Finish: AWWA C550 epoxy coating.

C. Wall Indicator Posts:
1. UL 789 and FM 1110 listed, wall-mounted indicator post for operating sprinkler-system isolation valves located on opposite side of wall.
2. Body: Cast or ductile iron.
3. Operation: Lockable handwheel.
4. Finish: AWWA C550 epoxy coating.

2.07 TRIM AND DRAIN VALVES

A. Ball Valves:
1. Description:
a. UL 258 or FM 1140 listed.
b. Pressure Rating: 175 psig (1200 kPa).
c. Body Design: Two piece.
d. Body Material: Forged brass or bronze.
e. Port Size: Full or standard.
f. Seat: PTFE.
g. Stem: Bronze or stainless steel.
h. Ball: Chrome-plated brass.
i. Actuator: Hand-lever.
j. End Connections: Threaded or grooved.

B. Angle Valves:
1. Description:
a. UL 258 or FM 1140 listed.
b. Pressure Rating: 175 psig (1200 kPa).
c. Body Material: Brass or bronze.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:
1. Description:
a. UL 258 or FM 1140 listed.
b. Pressure Rating: 175 psig (1200 kPa).
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc Holder and Nut: Bronze.
g. Disc Seat: Nitrile.
h. Packing: Asbestos free.
i. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage.
   1. Check bolting for proper size, length, and material.
   2. Verify gasket for size, defects, damage, and suitable material composition for service.

F. Replace defective valves with new valves.

3.02 INSTALLATION

A. Install valves in accessible locations to allow for operation, inspections, tests, and maintenance.

B. Install listed valves in accordance with their listing.

C. Install valves in accordance with manufacturer's instructions.

D. Support valves independently of adjacent piping.

E. Install valves in horizontal piping with stem at or above pipe center.

F. Position valves to allow full actuator movement.

G. Install OS&Y valves with full clearance for rising stem. Install surrounding components so they do not interfere with nor are they impacted by full extension of rising stem.

H. Install supervised shutoff valves in supervised-open position.

I. Install permanent identification signs indicating portion of system controlled by each shutoff valve.

J. Install threaded-end valves with unions upstream and downstream.

K. Install valve tags. See Section 210553. Label valves in accordance with NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 210553
IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

2.02 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.

E. Color code as follows:
   1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic pipe markers in accordance with manufacturer's instructions.

B. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

END OF SECTION

SECTION 211200
FIRE-SUPPRESSION STANDPIPES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valves.

1.02 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

B. Section 210500 - Common Work Results for Fire Suppression: Fire protection piping.

C. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

1.03 REFERENCE STANDARDS

A. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

B. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015 (Reapproved 2021).

C. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2024.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.

B. Shop Drawings: Indicate supports, components, accessories, and sizes.
   1. Submit shop drawings and product data to Owner's insurance underwriter for approval.
   2. Submit proof of approval to Architect.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 14. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in shipping packaging until installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 VALVES

A. General Duty Valves: See Section 210523.

B. Specialty Valves:
   1. Hose Connection Valve:
      a. Angle type; brass finish; 2-1/2 inch NPS (65 mm, DN), thread to match fire department hardware, 300 psi (2,070 kPa) working pressure, with threaded cap and chain of same material and finish.
   2. Pressure Reducing Valve:
      a. Angle type; brass finish with inner hydraulic controls; 2-1/2 inch (65 mm, DN) size, thread to match fire department hardware, 400 psi (2,760 kPa) inlet pressure, with threaded cap and chain of same material and finish.
      b. Function: Reduce high inlet pressure down to an adjustable preset output maintained independent of flow rate fluctuations.
   3. Pilot Operated Control Valves:

a. Size: 1-1/2 to 8 inch, NPS (40 to 200 mm, DN), flanged or grooved end-connections.
b. Type: Field adjustable in-line valve rated for 400 psi (2,760 kPa) inlet pressure with outlet discharge field-set to system pressure.
c. Construction:
1) Body: ASTM A536, ductile iron, grade 65-45-12.
2) Internal Ferrous Materials: Coated with 4 mils, 0.004 inch (0.10 mm) of epoxy.
3) External Surface Coating: 4 mils, 0.004 inch (0.10 mm) of epoxy and fire red enamel.
4) Main Valve Seat Ring: ASTM B61, bronze.
5) Stem: Stainless Steel.
6) Elastomers for Diaphragms, Resilient seats, and O-rings: Buna-N.
7) Pilot Control: ASTM B61, bronze with stainless steel trim and pressure gages.

4. In-line or Angle Hose Valves:
a. Cast bronze, 2-1/2 inch, NPS (65 mm, DN) handwheel operated globe valve with grooved end connections, rated for 400 psi (2,760 kPa) inlet pressure with outlet discharge field-set to hose inlet pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 14.

C. Connect standpipe system to water source ahead of domestic water connection.

D. Where static pressure exceeds 100 psi (690 kPa) but is less than 100 psi (690 kPa) at any hose station, provide pressure orifice disc in discharge of hose station valve to prevent pressure on hose exceeding 90 psi (620 kPa).

E. Where static pressure exceeds 100 psi (690 kPa) at any hose station, provide pressure reducing valve to prevent pressure on hose exceeding 90 psi (620 kPa).

F. Flush entire system of foreign matter.

3.02 FIELD QUALITY CONTROL

A. Test entire system in accordance with NFPA 14.

B. Test shall be witnessed by Fire Marshal.

END OF SECTION

SECTION 211300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.02 RELATED REQUIREMENTS

A. Section 210553 - Identification for Fire Suppression Piping and Equipment.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL (DIR) - Online Certifications Directory; Current Edition.

D. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings and hydraulic calculations to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

E. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.05 QUALITY ASSURANCE

A. Comply with FM (AG) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

E. Equipment and Components: Provide products that bear FM (AG) label or marking.

F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Anvil International: www.anvilintl.com/#sle.
   2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   3. Viking Corporation: www.vikinggroupinc.com/#sle.
   4. Or equal.

2.02 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections per Civil Engineer.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.03 SPRINKLERS

A. Finished Ceiling Type: Concealed pendant type with matching screw on cover plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: To be selected by Architect .
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: To be selected by Architect .
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: To be selected by Architect .
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Residential Sprinklers: Institutional pendant or sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Finish: To be selected by Architect .
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
   4. Manufacturers:
      a. Tyco; Raven.
      b. Or equal.

E. Guards: Finish to match sprinkler finish.

F. Flexible Drop System: Stainless steel, multiple use, open gate type.
   1. Application: Use to properly locate sprinkler heads.

2. Include all supports and bracing.
3. Provide braided type tube as required for the application.
4. Manufacturers:
    a. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.
    b. Or equal.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
    1. Activate electric alarm.
    2. Test and drain valve.
    3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
    1. Backflow Preventer Test Connection:
        a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
        b. Furnish one valve for each 250 gpm (16 L/s) of system demand or fraction thereof.
        c. Provide permanent sign reading "Test Valve" in accordance with Section 210553.

D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

E. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

G. Fire Department Connections:
    1. Type: Free standing made of corrosion resistant metal complying with UL 405.
    2. Locate per Civil Engineer.
    3. Specifications as required by local Fire Marshal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Provide approved double check valve assembly at sprinkler system water source connection.

D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

E. Locate outside alarm gong on building wall.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

I. Flush entire piping system of foreign matter.

J. Install guards on sprinklers when the sprinkler deflector is installed below 7'-6" AFF.

K. Hydrostatically test entire system.

L. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

3.03 SCHEDULES

A. System Hazard Areas:
   1. Light Hazard: Common areas (chapter rooms, dining rooms, living rooms, studies, corridors, etc.), sleeping rooms including closets, bathrooms, stairwells.
   2. Ordinary Hazard, Group 1: Mechanical rooms, electrical rooms, kitchen / food service areas, laundry rooms, janitor closets, storage rooms.

B. Sprinklers:
   1. Concealed pendant: All areas with finished ceilings on Lower Level and Ground Floor.
   2. Exposed area, upright or sidewall: All areas without finished ceilings in Lower Level and Ground Floor.
   3. Residential pendant or upright: All areas on Second Floor and Third Floor.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
    a. Corrosion resistant.
    b. Underground, buried, and wet conditions.
5. Pressure Plates: Carbon steel or stainless steel.
6. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 m).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

E. Structural Considerations: Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
    a. Pack solid using mineral fiber complying with ASTM C592.
    b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.

6. Install in accordance with manufacturer's recommendations.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 220519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers.

C. Pressure-temperature test plugs.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2025).

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Bourdon Tube for Liquids and Gases:
   1. Dial Size and Cover: 4-1/2 inch (115 mm) diameter scale with polycarbonate window.
   2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
   3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
   4. Process Connection: Lower-back, 1/4 inch (8 mm, DN) NPT male except where noted.
   5. Gauge Wetted Materials: Cast aluminum with phosphor bronze case and brass socket rated to match process pressure and temperature range.

2.02 THERMOMETERS

A. General:
   1. Product Compliance: ASTM E1.
   2. Lens: Clear glass, except where stated.
   3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
   4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Straight: 5 inch (127 mm) v-shape lead-free brass case with clear glass window scale, 2 inch (50.8 mm) NPT stem, 3-1/4 inch (82.5 mm) NPT thermowell, and red or blue non-toxic organic liquid filled glass tube.

C. Thermometers - Adjustable Angle: 7 inch (177.8 mm) v-shape aluminum case with clear glass window scale, 6 inch (152.4 mm) NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

D. Thermometers - Dial Type:
   1. Fixed: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.
   2. Adjustable Angle: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.

2.03 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi (34.5 bar) capacity; 1/2 inch (13 mm) MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch (3 mm) pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:

1. Up to 200 degrees F (93 degrees C): Brass probe with neoprene core.

C. Accessories: Brass, lever-handle cock and snubber-filter.

D. Test Kit: Internally padded carrying case fitted with two 2-1/2 inch (60 mm) diameter pressure gauges, adapters, two 1/8 inch (3 mm) probes, and 1 inch (25 mm) dual-scale dial thermometers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.

B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.02 INSTALLATION

A. Install pressure gauges as follows:
1. At Pumps: Place single gauge before strainer, suction side and discharge side.
2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

B. Install thermometers as follows:
1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch (60 mm) to accommodate sockets. Ensure sockets are above insulation clearance.

C. Locate PT (pressure-temperature) test plugs adjacent to control device sockets.

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Angle valves.

B. Ball valves.

C. Check valves.

1.02 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.03 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

G. ASME B31.9 - Building Services Piping; 2025.

H. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

I. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).

J. MSS SP-45 - Drain and Bypass Connections; 2020.

K. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

L. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

N. NSF 61 - Drinking Water System Components - Health Effects; 2024.

O. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.
2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball.
   2. Swing Check (Pump Outlet):
      a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Required Valve End Connections for Non-Wafer Types:

F. Domestic, Hot and Cold Water Valves:
   1. 2 inch (50 mm, DN) and Smaller:
      a. Bronze: Provide with solder-joint or threaded ends.
      b. Bronze Angle: Class 125, bronze disc.
      c. Ball: Two piece, full port, bronze with bronze trim.
      d. Bronze Swing Check: Class 125, bronze disc.
   2. 2-1/2 inch (65 mm, DN) and Larger:
      a. Iron, 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Provide with threaded or flanged ends.
      b. Iron Ball: Class 150.

G. Sanitary Waste Water Valves:
   1. 2 inch (50 mm, DN) and Smaller:
      a. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Handwheel: Valves other than quarter-turn types.
2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller.

D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: Extended neck.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
4. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. Class 125; CWP Rating: 200 psi (1380 kPa):
1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. End Connections: Pipe thread.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1035 kPa).
3. WOG Rating: 600 psi (4140 kPa).
4. Body: Forged bronze.
5. Ends Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Stainless steel, blowout proof.
8. Ball: Chrome plated brass.
9. Manufacturers:
a. Apollo Valves: www.apollovalves.com/#sle.
b. NIBCO INC: www.nibco.com/#sle.
c. Or approved equal.

2.05 IRON, BALL VALVES

A. Class 125, Full Port, Stainless Steel Trim:
   1. Comply with MSS SP-72.
   2. CWP Rating: 200 psi (1380 kPa).
   3. Body: ASTM A536 Grade 65-45-12, ductile iron.
   4. End Connections: Flanged.
   5. Seats: PTFE.
   6. Stem: Stainless steel.
   7. Ball: Stainless steel.
   8. Operator: Lever with locking handle.
   9. Manufacturers:
      a. Apollo Valves: www.apollovalves.com/#sle.
      b. Or approved equal.

2.06 BRONZE, SWING CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. WOG Rating: 200 psi (1380 kPa).
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded.
   6. Disc: Bronze.
   7. Manufacturers:
      a. Apollo Valves: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.
      c. Or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe supports, guides, shields, and saddles.

F. Nonpenetrating rooftop supports for low-slope roofs.

G. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

M. FM (AG) - FM Approval Guide; Current Edition.

N. MFMA-4 - Metal Framing Standards Publication; 2004.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

P. UL (DIR) - Online Certifications Directory; Current Edition.

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for nonpenetrating rooftop supports.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

D. Do not use wire, chain, or perforated pipe strap for permanent supports unless specifically indicated or permitted.

E. Materials for Metal Fabricated Supports: Comply with Section 055000.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
   1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Manufacturers:

a. Anvil International, LLC: www.asc-es.com/#sle.
b. Custom Strut and Roll Forming, LLC: www.customstrut.com/#sle.
c. Gripple, Inc: www.gripple.com/#sle.
d. Unistrut, a brand of Atkore International, Inc: www.unistrut.com/#sle.
e. Or equal.
f. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. MFMA-4 compliant, pre-fabricated, MSS SP-58 Type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
3. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
4. Strut Channel or Bracket Material:
   a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
   1. Manufacturers:
      a. ABB Installation Products: electrification.us.abb.com/#sle.
      b. Gripple, Inc: www.gripple.com/#sle.
      c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
      d. Or equal.
      e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
   2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
   3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
      b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
      c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.

C. Channel Nuts:
   1. Manufacturers:
      a. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.
      b. FNW; 7821: www.fnw.com/#sle.
      c. Unistrut, a brand of Atkore International, Inc: www.unistrut.com/#sle.
      d. Or equal.
   2. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.

D. Cable Hanging System Kits:
   1. Manufacturers:
      a. Gripple, Inc: www.gripple.com/#sle.
      b. Or equal.
      c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Provide cable-wire in bulk or pre-cut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).
3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.

2.04 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

C. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).

D. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.

E. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish.

F. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

G. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.05 PIPE HANGERS

A. Band Hangers, Adjustable:
1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. J-Hangers, Adjustable:
1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

C. Swivel Ring Hangers, Adjustable:
1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

D. Clevis Hangers, Adjustable:
1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.06 PIPE CLAMPS

A. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

B. Extension Split Pipe Clamp:
1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Strut Clamps:
   1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
   2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil (26,398,000 V/m).
   3. Service Temperature Range: Minus 65 to 275 degrees F (Minus 53.8 to 135 degrees C).

D. Insulation Coupling:
   1. Two bolt-type clamps designed for installation under insulation.
   2. Material: Carbon steel with epoxy copper or zinc finish.

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Stanchions:
   1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
   2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
   3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

C. U-Bolts:
   1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

D. Pipe Shields for Insulated Piping:
   1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
   2. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
      d. Service Temperature: Minus 40 to 178 degrees F (Minus 40 to 81 degrees C).
      e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

E. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.

F. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
      c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

2.08 NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

A. Manufacturers:
   1. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.
   2. PHP Systems/Design: www.phpsd.com/#sle.
   3. Or equal.

B. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

C. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

D. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

E. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.

2.09 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.

H. Sheet Metal: Use sheet metal screws.

I. Wood: Use wood screws.

J. Plastic and lead anchors are not permitted.

K. Powder-actuated fasteners are not permitted.

L. Hammer-driven anchors and fasteners are not permitted.

M. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   1. Channel Material: Use galvanized steel.
   2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
   3. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Control panels, transducers, and other related control equipment products.
   3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Piping: 3/4 inch (20 mm) diameter and smaller.
   2. Manual operated and automated control valves.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

A. Description: Engraved piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.
   4. Nameplate Height: 3/4 inch (19 mm).

2.03 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Piping: 3/4 inch (20 mm) diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
      a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.

b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.

2. Secondary: Color scheme per fluid service.
   a. Fire Quenching Fluids: White text on red background.
   b. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
3. Tertiary: Other Details.
   a. Directional flow arrow.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber insulation.

B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

E. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

H. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Knauf Insulation: www.knaufinsulation.com/#sle.

B. Insulation: ASTM C547 and ASTM C795; rigid, preformed pipe insulation, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Indoor Vapor Barrier Finish:
   1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.03 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com/#sle.
      b. Or approved equal.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic: Compatible with insulation.

B. Reinforced Tape:
   1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
   2. Comply with UL 723 or ASTM E84.
   3. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   4. Finish: Match insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 2 inches (50 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply and Recirculation:
      a. Glass Fiber Insulation:
         1) Piping less than 1-1/2 inch: 1 inch thick.
         2) Piping 1-1/2 inch and larger: 1-1/2 inch thick.
   2. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Piping less than 1-1/2 inch: 1/2 inch thick.
         2) Piping 1-1/2 inch and larger: 1 inch thick.
   3. Roof Drain Bodies:
      a. Glass Fiber Insulation: 1 inch thick.
   4. Roof Drainage Within 10 Feet (3 Meters) of the Exterior:
      a. Glass Fiber Insulation: 1 inch thick.
   5. Roof Drainage Run Horizontal at Roof Level:
      a. Glass Fiber Insulation: 1 inch thick.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
B. Sanitary waste piping, above grade.
C. Grease Waste Piping.
D. Domestic water piping, buried within 5 feet (1500 mm) of building.
E. Domestic water piping, above grade.
F. Storm drainage piping, buried within 5 feet (1500 mm) of building.
G. Storm drainage piping, above grade.
H. Natural gas piping, buried within 5 feet (1500 mm) of building.
I. Natural gas piping, above grade.
J. Pipe flanges, unions, and couplings.
K. Pipe hangers and supports.

1.02 RELATED REQUIREMENTS

A. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
F. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.
G. ASME B31.1 - Power Piping; 2024.
H. ASME B31.9 - Building Services Piping; 2025.
I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
M. ASTM B32 - Standard Specification for Solder Metal; 2020.
N. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
P. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
Q. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
R. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

T. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.

W. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).

X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

Y. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

Z. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2025.

AA. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.

BB. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.

CC. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

DD. AWWA C651 - Disinfecting Water Mains; 2023.

EE. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

FF. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

GG. IAPMO (UPC) - Uniform Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

HH. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.

II. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

JJ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

KK. NSF 61 - Drinking Water System Components - Health Effects; 2024.

LL. NSF 372 - Drinking Water System Components - Lead Content; 2024.

MM. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

NN. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, solder, and flux (if used), complying with NSF 61 and NSF 372; label pipe and fittings.

B. Plenum-Installed Piping: Provide piping with flame spread index of 25 or less and smoke developed index of 50 or less when tested in accordance with ASTM E84 or UL 723.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.04 GREASE WASTE PIPING

A. Manufacturers:
   1. Charlotte Pipe and Foundry; HP Edge.
   2. Or approved equal.

B. Above and below grade grease waste piping (excluding indirect piping) shall be high performance coated hub-and-spigot, cast iron soil pipe and fittings conforming to ASTM A 74, service class.

C. At contractor's option, above grade grease waste piping shall be high performance coated hubless, cast iron soil pipe and fittins conforming to ASTM A 888 or CISPI 301.

D. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI), and listed by NSF International.

E. Coating Performance: Pipe and fitting coatings must pass the following performance specifications per EN 877:
   1. 350 hours of salt spray testing
   2. Resistance to wastewater for 30 days at 73°F.
   3. Chemical resistance from pH 2 topH 12 for 30 days at 73°F.
   4. Resistance to hot water for 24 hours at 203°F.

2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (Type B), drawn temper.
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: ASTM B32, solder.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: ASTM B32 solder.
   3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.
      a. Manufacturers:
         1) Anvil International: www.anvilintl.com/#sle.
         2) Apollo Valves: www.apollovalves.com/#sle.
         3) NIBCO INC: www.nibco.com/#sle.
         4) Or approved equal.

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
   1. PPI TR-4 Pressure Design Basis:
      a. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
   2. Fittings: Brass and copper.
   3. Joints: ASTM F1960 cold-expansion fittings.

2.07 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.08 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 extra heavy weight.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.11 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 3 inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

C. No-Hub Couplings:
   1. Testing: In accordance with ASTM C1277 and CISPI 310.
   2. Gasket Material: Neoprene complying with ASTM C564.
   3. Band Material: Stainless steel.
   4. Eyelet Material: Stainless steel.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.12 PIPE HANGERS AND SUPPORTS

A. See Section 220529 for additional requirements.

B. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
   6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High-density polypropylene.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment and Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
      e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

C. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
   4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

D. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.
4. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Floor Support for Hot Pipe Sizes to 4 inch (100 mm, DN): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Provide support for utility meters in accordance with requirements of utility companies.

I. Install water piping to ASME B31.9.

J. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

K. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

L. Sleeve pipes passing through partitions, walls, and floors.

M. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm, DN).
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

N. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.

2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Support cast iron drainage piping at every joint.

O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide spring-loaded check valves on discharge of water pumps.

E. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
1. Perform hydrostatic testing for leakage prior to system disinfection.
2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
3. General:
   a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).

C. Gas Distribution Systems:
1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
2. General Systems:
   a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
   b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

3.09 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
      d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 5/8 inch (15 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 221119
DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backflow preventers.

B. Vacuum breakers.

C. Water pressure reducing valves.

D. Mixing valves.

E. Strainers.

F. Outlet boxes.

G. Hose bibbs.

H. Hydrants.

I. Drain valves.

J. Water-hammer arrestors.

K. Trap primers.

1.02 ABBREVIATIONS AND ACRONYMS

A. DZR: Dezincification resistant.

1.03 REFERENCE STANDARDS

A. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers; 2021.

B. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.

C. ASSE 1010 - Performance Requirements for Water Hammer Arresters; 2021.

D. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

E. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

F. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

G. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).

H. ASSE 1018 - Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied; 2023.

I. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.

J. ASSE 1020 - Performance Requirements for Pressure Vacuum Breaker Assemblies; 2020 (Reaffirmed 2025).

K. ASSE 1022 - Performance Requirements for Backflow Preventer for Beverage Dispensing Equipment (for Carbonated and Non-Carbonated); 2023.

L. ASSE 1052 - Performance Requirements for Hose Connection Backflow Preventers; 2023.

M. ASSE 1053 - Performance Requirements for Dual Check Backflow Preventer Wall Hydrants - Freeze Resistant Type; 2019 (Reaffirmed 2023).

N. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

O. AWWA C511 - Reduced-Pressure Principle Backflow Prevention Assembly; 2017 (Reaffirmed 2021).

P. NSF 61 - Drinking Water System Components - Health Effects; 2024.

Q. NSF 372 - Drinking Water System Components - Lead Content; 2024.

R. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

C. Maintenance Materials: Furnish the following for Owner's use in project maintenance:
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Loose Keys for Hydrants: Two.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products complying with NSF 61 and NSF 372.

B. Source Limitations: Furnish domestic water piping specialties of same kind by same manufacturer.

C. Provide brass-bodied domestic water piping specialties in DZR brass.

2.02 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. Manufacturers:
      a. MIFAB, Inc: www.mifab.com/#sle.
      b. Zurn Industries, LLC: www.zurn.com/#sle.
      c. Watts.
      d. Or approved equal.
   2. NPS 2 (DN 50) and Smaller:
      a. Assembly: ASSE 1013 and AWWA C511.
      b. Backflow Valve: Manufactured from bronze.
      c. Isolation Valves: Ball valves on inlet and outlet.
      d. Maximum Working Pressure: 175 psi (12.1 bar).
      e. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).
      f. Accessories:
         1) Air gap fitting.
         2) Flood detection sensor.
         3) Inlet strainer.

B. Intermediate Atmospheric-Vent Backflow Preventers:
   1. Valve: ASSE 1012, bronze, with union ends.
   2. Maximum Working Pressure: 175 psi (12.1 bar).
   3. Working Temperature Range: 33 to 210 degrees F (0.5 to 99 degrees C).

C. Carbonated-Beverage Backflow Preventers:
   1. Valve: ASSE 1022, stainless steel. Provide with integral strainer or with manufacturer's upstream wye-pattern strainer.
   2. Maximum Working Pressure: 150 psi (10.3 bar).
   3. Working Temperature Range: 33 to 130 degrees F (0.5 to 54 degrees C).

D. Hose-Connection Backflow Preventers:
   1. Valve: ASSE 1052, brass, nonremovable once installed, drainable, with hose-thread end connections.
      a. Provide with chrome finish when associated faucet, hose bibb, or hydrant is specified in chrome.
   2. Maximum Working Pressure: 125 psi (8.6 bar).

3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

2.03 VACUUM BREAKERS

A. Atmospheric Vacuum Breakers:
   1. Valve: ASSE 1001, bronze.
   2. Maximum Working Pressure: 125 psi (8.6 bar).
   3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

B. Hose-Connection Vacuum Breakers:
   1. Valve: ASSE 1011, brass, nonremovable, drainable, with hose-thread end connections.
   2. Maximum Working Pressure: 125 psi (8.6 bar).
   3. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

C. Pressure Vacuum Breakers:
   1. Valve: ASSE 1020, bronze.
      a. Provide freeze-resistant vacuum breaker assembly with integral anti-freeze relief valve.
   2. Maximum Working Pressure: 150 psi (10.3 bar).
   3. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.04 WATER PRESSURE REDUCING VALVES

A. Direct-Acting Pressure Reducing Valves:
   1. Manufacturers:
      a. Zurn Industries, LLC: www.zurn.com/#sle.
      b. Or approved equal.
   2. Valve: ASSE 1003, bronze body, with spring-loaded diaphragm; field-adjustable outlet pressure, and integral inlet screen strainer.
      a. Diaphragm: EPDM or buna-nitrile.
      b. Spring: Stainless steel.
      c. Provide with doubleunion ends.
   3. Maximum Working Pressure: 300 psi (20.7 bar).
   4. Outlet Pressure Range: 15 to 75 psi (100 to 515 kPa).
   5. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.05 MIXING VALVES

A. Water Temperature Limiting Valves:
   1. Valve: ASSE 1070, bronze body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment with high-temperature limit stop; integral check valves with strainer screens on inlets.

B. Automatic Compensating Valves for Individual Showers and Combination Tub-Showers:
   1. Valve: ASSE 1016, pressure balancing, bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.

2.06 STRAINERS

A. NPS 2 (DN 50) and Smaller:
   1. Body: Wye-pattern in bronze.
   2. Screen: Stainless steel mesh.
   3. Pressure Rating: 200 psi (13.8 bar).

2.07 OUTLET BOXES

A. Washing Machine Outlet Boxes:
   1. Manufacturers:
      a. IPS Corporation.
      b. Oatey.
      c. Zurn.
      d. Or approved equal.

2. As scheduled on drawings
3. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.
4. Accessories:
    a. Water-hammer arrestors.
    b. Support brackets for installation between framing studs.

B. Ice Maker Outlet Boxes:
1. Manufacturers:
    a. IPS Corporation.
    b. Oatey.
    c. Zurn.
    d. Or approved equal.
2. As scheduled on drawings.
3. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour-rated walls.
4. Accessories:
    a. Water-hammer arrestors.
    b. Support brackets for installation between framing studs.

2.08 HOSE BIBBS

A. Manufacturers:
1. Woodford.
2. Zurn.
3. Or approved equal.

B. Hose Bibbs:
1. Valve: Bronze or brass body with mounting flange, replaceable seat, hose thread spout, and integral or add-on vacuum breaker complying with ASSE 1011.
2. Operation:
    a. Mechanical and Equipment Rooms: Handwheel, T-handle, or lever.
3. Finishes:
    a. Mechanical and Equipment Rooms: Provide in polished chrome, polished brass, rough chrome, or rough brass.
4. Maximum Working Pressure: 125 psi (8.6 bar).
5. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).

2.09 HYDRANTS

A. Wall Hydrants:
1. Manufacturers:
    a. Zurn Industries, LLC: www.zurn.com/#sle.
    b. Woodford.
    c. Or approved equal.
2. Assembly: ASSE 1011, ASSE 1019, ASSE 1052, or ASSE 1053.
3. Hydrant: Freeze-resistant, self-draining, wall-mounted.
    a. Valve: Bronze or brass body.
    b. Hose Connection: Threaded, with integral vacuum breaker or backflow preventer.
    c. Hose Connection Size: 3/4 inch (19 mm).
    d. Installation: Recessed lockable box.
    e. Exterior Finish: Polished chrome.
    f. Operation: Loose key.
4. Maximum Working Pressure: 125 psi (8.6 bar).
5. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).

B. Roof Hydrants:
1. Manufacturers:
    a. Woodford.
    b. Zurn.

c. Or approved equal.

2. Hydrant: Freeze-resistant, self-draining, with post-mounted epoxy-coated cast-iron head and lift handle.
   a. Roof Interface: Cast-iron roof support sleeve and mounting plate with anchor flange and clamping collar.
   b. Valve: Bronze or brass valve, installed below roof line, connected to hydrant head via operating rod.
   c. Post: Galvanized-steel pipe. Post acts as casing for water carrier pipe and operating rod.
   d. Hose Connection: Threaded. Provide field-installed vacuum breaker or backflow preventer.
   e. Hose Connection Size: 3/4 inch (19 mm).
   f. Operation: Cast-iron lift handle, lockable.
3. Maximum Working Pressure: 125 psi (8.6 bar).
4. Working Temperature Range: 33 to 120 degrees F (0.5 to 50 degrees C).

2.10 DRAIN VALVES

A. Ball-Valve Hose-End Drain Valves:
   1. Valve: Two-piece, full-port ball valve in bronze with capped hose-end connection.
   2. Pressure Rating: 250 psi (17.2 bar).
   3. Working Temperature Range: 33 to 140 degrees F (0.5 to 60 degrees C).

2.11 WATER-HAMMER ARRESTORS

A. Manufacturers:
   1. Zurn Industries, LLC: www.zurn.com/#sle.
   2. Sioux Chief.
   3. Or approved equal.

B. Piston Type:
   1. Description: ASSE 1010 or PDI-WH 201, copper body with plastic piston and EPDM O-rings.
   2. Air Preload Pressure: 60 psi (410 kPa).
   3. Maximum Working Pressure: 150 psi (10.3 bar).
   4. Working Temperature Range: 33 to 180 degrees F (0.5 to 82 degrees C).

2.12 TRAP PRIMERS

A. Water-Supplied Trap Primers:
   1. Manufacturers:
      a. Watts.
      b. Or approved equal.
   2. Description: ASSE 1018, bronze or brass body, water-supplied, pressure-drop activated trap primer with internal filter screen and integral vacuum breaker.
   3. Operating Pressure Range: 20 to 80 psi (140 to 550 kPa).
   4. Activation Pressure Drop: 3 psi (20 kPa).
   5. Accessories:
      a. Shutoff valve on inlet.
      b. Manufacturer's distribution unit with four outlet ports.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard packing materials and verify product interiors are free from debris, damage, and corrosion.

B. Verify end connections, flanges, threads, and grooves are completely clean without signs of damage or degradation that could result in leakage.

C. For products containing isolation or shutoff valves, verify isolation and shutoff valves operate smoothly from fully closed to fully open.

3.02 INSTALLATION

A. Prior to installation of domestic water piping specialties, flush domestic water piping of foreign material.

B. Install products in accordance with manufacturer's instructions.

C. Install products level and plumb.

D. Install products with clearance for access and maintenance.

E. Support products NPS 2-1/2 (DN 65) and larger independently of surrounding pipe.

F. Support products with flanged or grooved ends independently of surrounding pipe.

G. For products containing isolation or shutoff valves, locate valves in horizontal piping with stems at or above center of piping, maintaining unimpeded stem movement.

H. Backflow Preventers:
   1. Install backflow preventers in accordance with requirements of local authorities having jurisdiction, including requirements of local water utility.
   2. Pipe relief from reduced-pressure-principle backflow preventers to nearest drain.

I. Water Pressure Reducing Valves:
   1. Install pressure gauges on outlet.

J. Water Hammer Arrestors: Install in accordance with PDI-WH 201.

K. Trap Primers:
   1. Install trap primers minimum of 12 inches (205 mm) above flood level of highest drain being served.
   2. Check that water flows through piping and that there are no leaks before pouring slabs or closing in walls.
   3. Cap unused ports on distribution manifold.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect each product for damage and defects.

C. Repair or replace damaged products.

D. Replace defective products.

E. For products containing isolation or shutoff valves, exercise isolation and shutoff valves from fully closed to fully open. Confirm smooth operation.

F. Backflow Preventers:
   1. Test in accordance with manufacturer's instructions.
   2. Test in accordance with requirements of authorities having jurisdiction.
   3. Test in accordance with ASSE listing of backflow preventer.
   4. Replace backflow preventers that fail testing.

G. Vacuum Breakers:
   1. Test in accordance with manufacturer's instructions.
   2. Test in accordance with requirements of authorities having jurisdiction.
   3. Test in accordance with ASSE listing of vacuum breaker.
   4. Replace vacuum breakers that fail testing.

H. Water Pressure Reducing Valves: Confirm outlet pressure remains steady without fluctuation.

I. Mixing Valves: Confirm outlet temperature remains steady without fluctuation.

J. Coordination of Other Tests and Inspections: Provide access to accommodate tests and inspections by independent testing agencies employed by Owner.

3.04 SYSTEM STARTUP

A. Prepare and start products, equipment, and systems in accordance with manufacturers' instructions and recommendations.

3.05 ADJUSTING

A. Adjust pressure reducing valves to design pressure set point.

B. Adjust mixing valves to design temperature set point.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean products to remove dirt, paint, and other foreign materials.

C. Clean surfaces of products exposed to view in finished spaces to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.

D. Clean surfaces of products exposed to view on building exterior to remove dirt, fingerprints, paint, and other foreign materials. Restore finishes to match original factory finish.

E. Remove debris and clean interiors of equipment cabinets.

F. Clean strainers, including those internal to other products, prior to mm-dd-yyyy.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221319
SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drains and sinks.

B. Shower channel drains.

C. Cleanouts.

1.02 REFERENCE STANDARDS

A. ASSE 1072 - Performance Requirements for Barrier Type Trap Seal Protection for Floor Drains; 2020.

B. NSF 14 - Plastics Piping System Components and Related Materials; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

D. Store products under cover and protected from weather and dirt. Elevate above grade.

E. Store plastic products protected from direct sunlight.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Plastic Sanitary Waste Piping Specialties: Provide plastic products that comply with NSF 14.

B. Source Limitations: Furnish drains and sanitary waste piping specialties of same kind by same manufacturer.

2.02 FLOOR DRAINS AND SINKS

A. Manufacturers:
   1. Josam Company.
   2. MIFAB.
   3. Zurn.
   4. Or approved equal.

B. As scheduled on drawings.

2.03 SHOWER CHANNEL DRAINS

A. Manufacturers:
   1. Schluter Systems.
   2. Or approved equal.

B. As scheduled on drawings.

2.04 CLEANOUTS

A. Manufacturers:
   1. MIFAB, Inc: www.mifab.com/#sle.

2. Zurn Industries, LLC: www.zurn.com/#sle.
3. Or approved equal.

B. As scheduled on drawings.

2.05 MISCELLANEOUS SANITARY WASTE PIPING SPECIALTIES

A. Floor Drain Trap Seals:
1. Manufacturers:
a. MIFAB, Inc; MI-GARD: www.mifab.com/#sle.
b. Zurn Industries, LLC; Z1072: www.zurn.com/#sle.
c. Or approved equal.
2. Assembly: ASSE 1072.
3. Description: Push-fit EPDM or silicone fitting with one-way-flow membrane or flapper.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions are satisfactory for installation prior to starting work.

B. Verify floor sink locations are coordinated with latest published kitchen equipment plans and plumbing plans.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars and bonding flanges.

C. Install drains so strainers and grates are level and are at design elevation.

D. Install floor sinks so grates are flush with finished floor unless noted otherwise or unless directed otherwise by adopted code.

E. Install trench drains and channel drains parallel and perpendicular to building lines, unless designated otherwise.

F. Install grates in trench drains so grates do not rock, slip, or shift.

G. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.

H. Install floor cleanouts to allow for floor finishes.

I. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.03 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean debris from drains.

3.04 PROTECTION

A. Protect installed drains from accumulating dirt and debris through remainder of construction.

B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221323
SANITARY WASTE INTERCEPTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grease interceptors.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ASME A112.14.3 - Hydromechanical Grease Interceptors; 2022.

B. PDI G101 - Testing and Rating Procedure for Grease Interceptors; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, capabilities, rated flow rates, retention capacities, rough-in requirements, location and sizes of piping connections, service and access locations, and manufacturer-provided and field-installed accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Source Limitations: Furnish interceptors of same kind by same manufacturer.

2.02 GREASE INTERCEPTORS

A. Hydromechanical Grease Interceptors, 50 gpm (3.0 L/sec) and Larger:
   1. Manufacturers:
      a. MIFAB, Inc: www.mifab.com/#sle.
      b. Schier.
      c. Or approved equal.
   2. Assembly: PDI G101 and ASME A112.14.3.
   3. Body: Thermoplastic polymer.
   4. Chambers: One.
   5. Service Access:
      a. Manholes: Minimum of one manhole per chamber.
         1) Manhole Covers, Traffic Rated: Cast iron or steel-encased composite, gasketed, gastight, and watertight; rated for minimum loading of 16,000 lb (7260 kg).
   6. Construction Details:
      a. Flow control fitting.
      b. Deep seal trap.
      c. Internal baffles.
      d. Internal air relief bypass.
   7. Unit Capacity: As scheduled on drawings.
   8. Accessories:
      a. Anchor kit.

b. External accessory sampling port.
c. Manhole risers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements are as indicated.

B. Verify rough-ins for field connections match sizes and locations shown on drawings.

C. Verify field piping connections are at inverts indicated on drawings.

D. Verify excavation, trenching, and bedding are complete and ready to receive equipment.

E. Verify anchoring slabs, foundations, and structures are ready to receive equipment.

F. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions, adopted code, and requirements of local authorities having jurisdiction.

B. Install interceptors level and plumb.

C. Refer to drawings and see Section 221005 for requirements for waste and vent piping to and from interceptors.

D. Support waste and vent piping independently from interceptors.

E. Vent interceptors in accordance with adopted code and with requirements of local authorities having jurisdiction.

F. Install interceptors with clearance for access and maintenance, including removal of sediment buckets, screens, and strainers.

G. Install manhole risers so manhole covers are level with finished grade.

H. Install anchor kits in accordance with manufacturer's instructions.

I. Backfill buried interceptors in accordance with manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Test interceptors for leaks in accordance with manufacturer's instructions.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean debris from within interceptors.

C. Clean manhole covers to remove dirt, debris, and other foreign material.

3.05 CLOSEOUT ACTIVITIES

A. Engage manufacturer's authorized representative to demonstrate maintenance procedures of interceptors to Owner's designated representative.

3.06 PROTECTION

A. Protect installed interceptors from accumulating dirt and debris through remainder of construction.

B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221423
STORM DRAINAGE PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof and exterior surface drains.

B. Downspout adaptors, boots, and nozzles.

C. Backwater valves.

1.02 REFERENCE STANDARDS

A. ASME A112.14.1 - Backwater Valves; 2003 (Reaffirmed 2022).

B. NSF 14 - Plastics Piping System Components and Related Materials; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

D. Store products under cover and protected from weather and dirt. Elevate above grade.

E. Store plastic products protected from direct sunlight.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Plastic Storm Drainage Piping Specialties: Provide plastic products complying with NSF 14.

B. Source Limitations: Furnish drains and storm drainage piping specialties of same kind by same manufacturer.

2.02 ROOF AND EXTERIOR SURFACE DRAINS

A. Manufacturers:
   1. MIFAB.
   2. Zurn.
   3. Or approved equal.

B. As scheduled on drawings.

2.03 DOWNSPOUT ADAPTERS, BOOTS, AND NOZZLES

A. Downspout Nozzles, Metal:
   1. Manufacturers:
      a. Zurn.
      b. Or approved equal.
   2. Description: Cast nickel bronze wall-mounted fitting for terminating interior rainwater leader on building exterior, with anchor flange and decorative cow's tongue outlet.
      a. Provide with stainless steel bird screen.

2.04 BACKWATER VALVES

A. Manufacturers:

1. Zurn Industries, LLC: www.zurn.com/#sle.
2. Or approved equal.

B. Cast Iron Backwater Valves:
1. Assembly: ASME A112.14.1.
2. Horizontal: Lacquered cast iron body, flapper valve, and bolted, gasketed access cover.
3. Vertical: Lacquered cast iron body, ball-type float, and replaceable seals.

C. Plastic Backwater Valves:
1. Assembly: ASME A112.14.1.
2. Description: PVC body and flapper valve, with gasketed, threaded access cap.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars.

C. Install roof drains at low points of roof areas.

D. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.

E. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.03 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean debris from drains.

3.04 PROTECTION

A. Protect installed drains from accumulating dirt and debris through remainder of construction.

B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 221429
SUMP PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submersible sump pumps.

1.02 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump chart or curve with duty point marked over.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with three years minimum of documented experience.

B. Certifications: UL (DIR) listed, classified, and suitable for the purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for pumps and related components. Complete forms in Owner's name and register with manufacturer.

C. Submit warranty with related forms completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 SUBMERSIBLE SUMP PUMPS

A. Manufacturers:
   1. Zoeller Company: www.zoeller.com/#sle.
   2. Liberty Pumps.
   3. Or approved equal.

B. Performance: As scheduled on drawings.

C. General: Cast iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.

D. Impeller: Thermoplastic; open nonclog, stainless steel shaft.

E. Motor: Base mount, enclosed, lubricated oil-free, thermal-overload protected, continuous duty, permanent split capacitor with oil-resistant, three-prong connector, 10 foot (3 m) power cord.

F. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump Off/On between 2.5 and 9 inch (5.1 and 22.9 cm) heights from bottom of pump.

G. Solids Handling Capacity: Pass lint and other small solids up to 1/2 inch (15 mm) in size.

H. Discharge Pipe Size: 1-1/2 inch (40 mm, DN), NPT, female.

I. Maximum Water-Based Effluent Temperature: 120 degrees F (48,9 degrees C).

J. Accessories: Provide full flow swing-type discharge check valve and high-level audio/visual alarm system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings and accessories according to manufacturer instructions.

B. Observe and provide incidentals required to complete installation in compliance with ICC (IPC).

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Operational Tests: Conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 PROTECTION

A. Protect installed products from damage from subsequent construction operations.

END OF SECTION

SECTION 223000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial gas-fired water heaters.

B. Commercial electric water heaters.

C. Diaphragm-type compression tanks.

D. In-line circulator pumps.

E. Sanitary-sewage pumps.

1.02 RELATED REQUIREMENTS

A. Section 251500 - Integrated Automation Software.

1.03 REFERENCE STANDARDS

A. ANSI Z21.10.1 - Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2019 (Reaffirmed 2024).

B. ANSI Z21.10.3 - Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2019 (Reaffirmed 2024).

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

E. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data:
   1. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, weights, capabilities, performance, electrical characteristics, location and sizes of connections, service and access locations, and manufacturer-provided and field-installed accessories.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:
   1. Water Heaters: NSF approved.
   2. Gas Water Heaters: ANSI Z21.10.1 and ANSI Z21.10.3.
   3. Electric Water Heaters: UL listed and labeled to UL 174.
   4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for domestic water heaters. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Commercial Gas-Fired Water Heaters:
   1. Manufacturers:
      a. Lochinvar.
      b. A.O. Smith.
      c. Or approved equal.
   2. Type: Automatic, natural gas-fired, vertical storage.
   3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
   4. Performance: As scheduled on drawings.
   5. Tank: Glass-lined, welded steel,; multiple flue passages, 4-inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
   6. Accessories:
      a. Water Connections: Brass.
      b. Dip Tube: Brass.
      c. Drain valve.
      d. Anode: Magnesium.
      e. Temperature and Pressure Relief Valve: ASME labeled.
   7. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F (49 to 82 degrees C), automatic reset high temperature limiting thermostat factory set at 195 degrees F (90 degrees C), gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

B. Commercial Electric Water Heaters:
   1. Manufacturers:
      a. Bradford White Corporation: www.bradfordwhite.com/#sle.
      b. A.O. Smith.
      c. Or approved equal.
   2. Type: Factory-assembled and wired, electric, vertical storage.
   3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
   4. Performance: As scheduled on drawings.
   5. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
   6. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
   7. Accessories:
      a. Water Connections: Brass.
      b. Dip Tube: Brass.
      c. Drain valve.
      d. Anode: Magnesium.
      e. Temperature and Pressure Relief Valve: ASME labeled.

8. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com/#sle.
   2. Taco, Inc: www.taco-hvac.com/#sle.
   3. Watts.
   4. Or approved equal.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig (80 kPa).

2.03 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
   1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com/#sle.
   2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
   3. Or approved equal.

B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

G. Performance: As scheduled on drawings.

2.04 SANITARY-SEWAGE PUMPS

A. Sump Pumps: See Section 221429.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Electrical Work: Provide automatic control and protective devices with associated wiring to interconnect related interfaced devices required for specified operation.

C. Coordinate system, equipment, and piping work with applicable electrical, gas, vent, drain, and waste support interconnections as included or provided by other trades.

D. Domestic Hot Water Storage Tanks:
   1. Provide steel pipe support, independent of building structural framing members.
   2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

E. Pumps:
   1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
   2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches (100 mm) and over.
   3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

4. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 251500.

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tank type water closets.

B. Lavatories.

C. Sinks.

D. Under-lavatory pipe supply covers.

E. Bottle filling drinking fountains.

F. Mop sinks.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

C. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.

D. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

G. NSF 61 - Drinking Water System Components - Health Effects; 2024.

H. NSF 372 - Drinking Water System Components - Lead Content; 2024.

I. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, utility sizes, trim, and finishes.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide drinking water system components certified as complying with NSF 61 and NSF 372.

B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

C. Perform work in accordance with local health department regulations.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 TANK TYPE WATER CLOSETS

A. Manufacturers:
   1. American Standard: www.americanstandard-us.com/#sle
   2. Kohler Company: www.kohler.com/#sle.
   3. Zurn Industries, LLC: www.zurn.com/#sle.
   4. Or approved equal.

B. Floor-Mounted Bowl:
   1. ASME A112.19.2; siphon jet, vitreous china, 18 inches (450 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps.
   2. Water Consumption: 1.6 gal (6 L) per flush, maximum.
   3. Trapway Outlet: 4 inch (100 mm, DN).

C. Pressure-Assisted Flush Systems:
   1. Provide pressurized wash down vessel and components.
   2. Water Consumption: 1.6 gal (6 L) per flush.

D. Toilet Seats:
   1. Plastic: Solid, white, enlongated, open front, slow-closing hinged seat cover, extended back with self-sustaining hinges, and brass bolts with covers.
   2. Manufacturers:
      a. American Standard: www.americanstandard-us.com/#sle
      b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
      c. Or approved equal.

2.04 LAVATORIES

A. Manufacturers:
   1. American Standard[<>]: www.americanstandard-us.com/#sle
   2. Kohler Company: www.kohler.com/#sle.
   3. Or approved equal.

B. As scheduled on drawings.

2.05 SINKS

A. Manufacturers:
   1. Kohler Company: www.kohler.com/#sle.
   2. Just Manufacturing.
   3. Elkay.

B. As scheduled on drawings.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Truebro.
   3. Or approved equal.

B. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Adhesives, sewing threads and two ply laminated materials are prohibited.
   3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
   4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
      a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
      b. Comply with ASTM E84 for flame and smoke development.
      c. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
      d. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
      e. Comply with ICC A117.1.
   5. Color: High gloss white.
   6. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 BOTTLE FILLING DRINKING FOUNTAINS

A. Manufacturers:
   1. Elkay Manufacturing Company: www.elkay.com/#sle.
   2. Or approved equal.

B. As scheduled on drawings.

2.08 MOP SINKS

A. Manufacturers:
   1. Acorn Engineering Company: www.acorneng.com/#sle.
   2. Just Manufacturing Company: www.justmfg.com/#sle.
   3. Zurn Industries, LLC: www.zurn.com/#sle.
   4. Fiat.
   5. Or approved equal.

B. As scheduled on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.

B. Verify rough-ins for field connections match sizes and locations shown on drawings.

C. Verify electric power is available and of the correct characteristics.

D. Review casework and countertop shop drawings. Confirm locations and sizes of fixtures and openings before rough-in and installation.

E. Verify casework and countertops are prepared and ready for installation of fixtures.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install components level and plumb.

C. Secure fixtures in place.

D. Install rigid or flexible supplies to fixtures. Provide supply stops, reducers, and escutcheons.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Repair or replace damaged or defective products.

D. Test fixtures after installation to verify operation. Correct deficiencies.

3.04 ADJUSTING

A. Adjust stops and valves so fixtures operate without splashing, noise, or overflow.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean plumbing fixtures to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

END OF SECTION

SECTION 224017
BATHTUBS AND SHOWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Showers.

B. Bathtub and shower faucets, valves, and trim.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.

D. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).

E. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

F. NSF 61 - Drinking Water System Components - Health Effects; 2024.

G. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include materials of fabrication, rough-in requirements, location and sizes of connections, configurations, dimensions, finishes, features, and accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

D. Store products indoors in clean, dry area. Protect from water and dirt. Elevate above floor.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide supply fixtures, fittings, valves, and trim certified as complying with NSF 61 and NSF 372.

B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.

C. Maximum Fixture and Faucet Supply Pressure: 80 psi (550 kPa) unless stated otherwise.

2.02 SHOWERS

A. Tiled stall and accessories by others, refer to Architectural.

2.03 BATHTUB AND SHOWER FAUCETS, VALVES, AND TRIM

A. Shower Valves and Trim:
   1. Manufacturers:
      a. Kohler.
      b. Or approved equal.
   2. Assembly: ASME A112.18.1, with control valve, shower head, and arm.

3. Control Valve: ASSE 1016, pressure-balancing, bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.
4. Finish: As indicated on drawings.
5. Flow Rate: Maximum 2.5 gpm (9.5 L/min) at 80 psi (550 kPa).

B. Hand Showers:
1. Manufacturers:
   a. Kohler.
   b. Or approved equal.
2. Assembly: ASME A112.18.1 with shower wand, wall supply elbow, hose, and ASSE 1014 backflow preventer.
3. Control Valve: ASSE 1016, pressure balancing, bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.
4. Finish: As indicated on drawings.
5. Hose: Minimum 60-inch (1524 mm) flexible metal hose in finish to match shower wand.
6. Flow Rate: Maximum 2.5 gpm (9.5 L/min) at 80 psi (550 kPa).
7. Hand Shower Mounting:
   a. Mounting Bar: Minimum 24-inch (610 mm) long wall bar with adjustable slide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.

B. Verify rough-ins for field connections match sizes and locations shown on drawings.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products level and plumb.

C. Secure fixtures in place.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect each product for damage and defects.

C. Repair or replace damaged or defective products.

D. Test fixtures after installation to verify operation. Correct deficiencies.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean fixtures to remove dirt, fingerprints, paint, and other foreign material. Restore finishes to match original factory finish.

3.05 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

END OF SECTION

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

1.02 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 230517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Manufacturers:
   1. American Polywater Corporation; PZVR Watertight Wall Sleeves for Pipes: www.polywater-haufftechnik.com/#sle.
   2. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.

B. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.

C. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

E. Pipe Passing Through Mechanical and Laundry Room Floors above Basement:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

F. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Manufacturers:
   1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
   2. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.
   3. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.

B. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Glass-reinforced plastic pressure end plates.

C. Sealing Compounds:
   1. Provide packing and sealing compound to fill pipe to sleeve thickness.
   2. Combined packing and seal compound is to match partition fire-resistance hourly rating.

D. Pipe Sleeve Material:
   1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
   2. Masonry Structures: Sheet metal or fiber.

E. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

F. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.

E. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber in compliance with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
   4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 230519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electromagnetic flow meters.

B. Pressure gauges and pressure gauge taps.

C. Thermometers and thermometer wells.

D. Static pressure gauges.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

B. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2025).

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 ELECTROMAGNETIC FLOW METERS

A. Manufacturers:
   1. Badger Meter; ModMAG 2000: www.badgermeter.com/#sle.
   2. Foxboro, a brand of Schneider Electric; _____: www.schneider-electric.us/#sle.
   3. Onicon, Inc; _____: www.onicon.com/#sle.

B. Inline Type: Class 150 flanged with hard rubber liner, 1 inch (25 mm, DN).

C. Insertion Type: Include ball valve and threadolet.

D. Liquid Flow Capacity Range: As indicated on drawings.

E. Construction: Sensor with integral NEMA EN 10250 Type 4 or 4X stainless steel or aluminum enclosure to hold thermal mass sensor and circuits with numeric display for consumption reading.
   1. Electrode: Stainless steel.

F. Liquid Conductivity: 5 mS/cm, minimum.

G. Accuracy: Within 0.2 percent of value applied to manufacturer-specified velocity range.

H. Output: Two-wire, 0 to 10 VDC, non-loop powered.

I. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

J. Service Pressure and Temperature: Up to 400 psi (27.6 bar) and 15 to 250 degrees F (minus 9.4 to 125.6 degrees C) liquid side, 150 degrees F (65.5 degrees C) ambient.

2.02 PRESSURE GAUGES

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   2. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.
   3. Omega Engineering, Inc: www.omega.com/#sle.
   4. Winters Instruments: www.winters.com/#sle.

B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch (115 mm) diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.

2.03 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).

B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch (6 mm) connections.

D. Syphon: Steel, Schedule 40, 1/4 inch (6 mm) angle or straight pattern.

2.04 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
   2. Omega Engineering, Inc; _____: www.omega.com/#sle.
   3. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com/#sle.
   4. Winters Instruments; _____: www.winters.com/#sle.

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch (225 mm) scale.
   2. Window: Clear Lexan.
   3. Accuracy: 2 percent, per ASTM E77.
   4. Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch (225 mm) scale.
   2. Window: Clear Lexan.
   3. Stem: 3/4 inch (20 mm) NPT brass.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

2.05 DIAL THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
   2. Omega Engineering, Inc; _____: www.omega.com/#sle.
   3. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com/#sle.
   4. Winters Instruments; _____: www.winters.com/#sle.

B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch (125 mm) diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

2.06 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch (75 mm) outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.07 TEST PLUGS

A. Manufacturers:
   1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
   2. Watts Water Technologies, Inc; _____: www.watts.com/#sle.
   3. Weiss Instruments, LLC; _____: www.weissinstruments.com/#sle.
   4. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com/#sle.
   5. Winters Instruments; _____: www.winters.com/#sle.

B. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

2.08 STATIC PRESSURE GAUGES

A. Manufacturers:
   1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
   2. Omega Engineering, Inc; _____: www.omega.com/#sle.
   3. Veris Industries; _____: www.veris.com/#sle.
   4. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com/#sle.

B. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Provide siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.02 SCHEDULE

A. Flow Meters, Location:
   1. Heating water system.
   2. Chilled water system.

B. Pressure Gauges, Location:
   1. Pumps.
   2. Expansion tanks.
   3. Pressure/Buffer tanks.
   4. Pressure reducing valves, 0 to ____ psi (0 to ____ kPa).

C. Pressure Gauge Tappings, Location:
   1. Control valves 3/4 inch (20 mm) & larger - inlets and outlets.
   2. Major coils - inlets and outlets.
   3. Chiller - inlets and outlets.
   4. Boiler - inlets and outlets.

D. Stem Type Thermometers, Location:
   1. Boilers - inlets and outlets.
   2. Chiller - inlets and outlets.
   3. After major coils.

E. Thermometer Sockets, Location:
   1. Control valves 1 inch (25 mm) & larger - inlets and outlets.

F. Static Pressure and Filter Gauges, Location:
   1. AHU filter banks.
   2. Building static.

END OF SECTION

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Globe valves.

B. Ball valves.

C. Butterfly valves.

D. Check valves.

E. Gate valves.

F. Chainwheels.

1.02 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

G. ASME B31.9 - Building Services Piping; 2025.

H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

I. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).

K. MSS SP-67 - Butterfly Valves; 2022.

L. MSS SP-68 - High Pressure Butterfly Valves with Offset Design; 2021.

M. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.

N. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

O. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

P. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.

Q. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

R. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided; 2018.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.

2. Protect valve parts exposed to piped medium against rust and corrosion.
3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
5. Secure check valves in either the closed position or open position.
6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly, Ball, and Globe.
   2. Isolation (Shutoff): Butterfly, Gate, and Ball.
   3. Swing Check (Pump Outlet):
      a. Size 2 inch (50 mm, DN) and Smaller: Bronze with bronze disc.
      b. Size 2-1/2 inch (65 mm, DN) and Larger: Iron with lever and weight, lever and spring, center-guided metal, or center-guided with resilient seat.
   4. Dead-End: Butterfly, single-flange (lug) type.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Chilled Water and Heating Water Valves:
   1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
      a. Solder-joint, threaded, or press ends.
      b. Ball: Full port, one piece, brass trim.
      c. Swing Check: Bronze disc, Class.
      d. Globe: Bronze disc, Class 125.
   2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
      a. 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Flanged ends.
      b. Ball: 2-1/2 NPS (65 DN) to 10 inch (250 mm, DN), Class 150.
      c. Single-Flange Butterfly: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), aluminum-bronze disc, EPDM seat, 200 CWP.
      d. Butterfly: High performance, single flange, Class 150.
      e. Swing Check: Metal seats, Class 125.
      f. Center-Guided Check: Compact-wafer, metal seat, Class 125.
      g. Gate: NRS, Class 125.
      h. Globe: Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller.

D. Valves in Insulated Piping: Provide 2 inch (50 mm, DN) stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
   3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
   4. Solder Joint Connections: ASME B16.18.

G. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
   2. Building Services Piping Valves: ASME B31.9.

H. Bronze Valves:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

2.03 BRONZE, GLOBE VALVES

A. CWP Rating: Class 125: 200 psi (1,380 kPa):
   1. Comply with MSS SP-80, Type 1.
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
   3. Ends: Threaded or solder joint or press.
   4. Stem and Disc: Bronze or PTFE.
   5. Packing: Asbestos free.
   6. Handwheel: Malleable iron.
   7. Manufacturers:
      a. Apollo Valves: www.apollovalves.com/#sle.

2.04 IRON, GLOBE VALVES

A. CWP Ratings: Class 125: 200 psi (1,380 kPa) and Class 250: 500 psi (3,450 kPa):
   1. Comply with MSS SP-85, Type I.
   2. Body: Gray iron; ASTM A126, with bolted bonnet.
   3. Ends: Flanged.
   4. Trim: Bronze.
   5. Packing and Gasket: Asbestos free.
   6. Operator: Handwheel or chainwheel.
   7. Manufacturers:
      a. Apollo Valves: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.05 BRASS, BALL VALVES

A. One Piece, Full Port with Brass Trim and Press, Threaded, or Soldered Connections:
   1. Comply with MSS SP-110.
   2. CWP Rating: 200 psi (1,379 kPa).
   3. Body: Forged brass.
   4. Seats: PTFE or TFE.
   5. Stem: Brass.
   6. Ball: Chrome-plated brass.
   7. Operator: Handle.

2.06 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Brass Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi (1,035 kPa).
   3. WOG Rating: 400 psi (2,758 kPa).
   4. Body: Forged bronze or dezincified-brass alloy.
   5. End Connections: Pipe press, thread, or solder.
   6. Seats: PTFE.
   7. Stem: Bronze or brass.
   8. Ball: Chrome plated brass.
   9. Manufacturers:
      a. Apollo Valves: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.07 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Wafer and Lug Style:
   1. Class 125 or 150.
   2. Comply with MSS SP-67, Type I.
   3. Wafer Style, CWP Ratings:
      a. Sizes 2 to 12 inches (50 to 300 mm, DN): 200 psi (1380 kPa).
   4. Lug Style, CWP Ratings:
      a. Sizes 2 to 12 inches (50 to 300 mm, DN): 250 psi (1725 kPa).
   5. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
   6. Stem: One or two-piece stainless steel.
   7. Seat: NBR.
   8. Disc: Aluminum-bronze.
   9. Manufacturers:
      a. Apollo Valves; _____: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.08 HIGH-PERFORMANCE, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type; Bidirectional dead end service without downstream flange:
   1. Comply with MSS SP-68.
   2. Class 150: CWP Rating: 285 psi (1,965 kPa) at 100 degrees F (38 degrees C).
   3. Body: Provide carbon steel or stainless steel.
   4. Seat: Reinforced PTFE.
   5. Offset stem: Stainless steel.
   6. Disc: Stainless steel.
   7. Manufacturers:
      a. Apollo Valves; _____: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.09 BRASS, INLINE CHECK VALVES

A. Class 150: CWP Rating: 200 psi (1,380 kPa) .

B. Maximum Service Temperature: 250 degreess F (121.1 degreess C).

C. Body: Forged brass.

D. Disc: Forged brass.

E. Seal: PTFE, bubble tight.

F. End-Connections: Soldered.

2.10 BRASS, HORIZONTAL SWING CHECK VALVES

A. Threaded End-Connections:
   1. Class 125: CWP Rating: 200 psi (1,380 kPa).
   2. Body: Forged brass.
   3. Disc: Forged brass.
   4. Hinge-Pin, Screw, and Cap: Forged brass.

B. Press End-Connections:
   1. Class 125: WOG Rating: 200 psi (1,380 kPa).
   2. Body: Forged brass.
   3. Disc: Forged brass.
   4. Hinge-Pin, Screw, and Cap: Forged brass.

2.11 BRONZE, LIFT CHECK VALVES

A. Class 125:
   1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
   2. CWP Rating: 200 psi (1,380 kPa).
   3. Design: Vertical flow.
   4. Body: Bronze.
   5. Ends: Threaded.
   6. Disc (Type 1): Bronze.
   7. Disc (Type 2): NBR or PTFE.

2.12 BRONZE, SWING CHECK VALVES

A. Class 125:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. WSP Rating: 200 psi (1,380 kPa).
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded or soldered.
   6. Disc: Bronze.
   7. Manufacturers:
      a. Apollo Valves; _____: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.13 IRON, FLANGED END SWING CHECK VALVES

A. Class 125:
   1. 150 psi (1,035 kPa) with metal seats.
   2. 200 psi (1,380 kPa) with metal seats and nonmetallic-to-metal seats.

B. Manufacturers:
   1. Apollo Valves; _____: www.apollovalves.com/#sle.
   2. NIBCO INC: www.nibco.com/#sle.

2.14 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:
   1. Comply with MSS SP-71, Type I.
   2. Body Design: Clear or full waterway.
   3. Body Material: ASTM A126, gray iron with bolted bonnet.
   4. Ends: Flanged.
   5. Trim: Bronze.
   6. Gasket: Asbestos free.
   7. Closer Control: Factory installed, exterior lever, and spring or weight.
   8. Manufacturers:

a. Apollo Valves; _____: www.apollovalves.com/#sle.

2.15 IRON, CENTER-GUIDED CHECK VALVES

A. Class 125, Compact-Wafer:
   1. Comply with MSS SP-125.
   2. Sizes 2-1/2 to 12 inch (65 to 300 mm, DN): CWP Rating; 200 psi (1,380 kPa).
   3. Body Material: ASTM A126, gray iron.
   4. Manufacturers:
      a. Apollo Valves; _____: www.apollovalves.com/#sle.
      b. NIBCO INC: www.nibco.com/#sle.

2.16 IRON, GATE VALVES

A. NRS or OS&Y:
   1. Comply with MSS SP-70, Type I.
   2. Class 125:
      a. Sizes 2-1/2 to 12 inch (65 to 300 mm, DN), CWP Rating; 200 psi (1,380 kPa).
   3. Body Material: Gray iron with bolted bonnet.
   4. Ends: Flanged.
   5. Trim: Bronze.
   6. Disc: Solid wedge.
   7. Packing and Gasket: Asbestos free.
   8. Manufacturers:
      a. NIBCO INC: www.nibco.com/#sle.

2.17 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
   1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
   2. Attachment: For connection to ball, butterfly, and plug valve stems.
   3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
   4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Lift Check: Install with stem plumb and vertical.
   2. Swing Check: Install horizontal maintaining hinge pin level.
   3. Orient center-guided into horizontal or vertical position, between flanges.

D. Provide chainwheels on operators for valves 4 NPS (100 DN) and larger where located 96 inches (2.4 m) or more above finished floor, terminating 60 inches (1.5 m) above finished floor.

END OF SECTION

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

M. FM (AG) - FM Approval Guide; Current Edition.

N. MFMA-4 - Metal Framing Standards Publication; 2004.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

P. UL (DIR) - Online Certifications Directory; Current Edition.

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
   2. Strut Channel or Bracket Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
   4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
   5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm) diameter.
      b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm) diameter.
      c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm) diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

D. Cable Hanging System Kits:
   1. Manufacturers:
      a. Ductmate Industries, Inc; _____: ductmate.com/#sle.
      b. Gripple, Inc: www.gripple.com/#sle.
   2. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).
   3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.

E. Thermal Insulated Pipe Supports:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.

2. PVC Jacket:
a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
c. Thickness: 60 mil (1.524 mm).

3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

F. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
b. Support From Below: MSS SP-58 Types 35 through 38.
3. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

G. Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

H. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

I. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

J. U-Bolts:
   1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

K. Insulation Clamps:
   1. Two bolt-type clamps designed for installation under insulation.
   2. Material: Carbon steel with epoxy copper or zinc finish.

L. Pipe Hangers:
   1. J-Hangers, Adjustable:
      a. MSS SP-58 Type 5, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
      b. Felt-Lining: Provide for uninsulated pipe to reduce noise and prevent static issues.
   2. Clevis Hangers, Adjustable:
      a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
      b. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
      c. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).

M. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

N. Pipe Shields for Insulated Piping:
   1. MSS SP-58 Type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel
   2. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
      d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
      e. Maximum Service Temperature: 178 degrees F (81 degrees C).
      f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

O. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 230533
HEAT TRACING FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-regulating parallel resistance electric heating cable.

B. Controls.

1.02 REFERENCE STANDARDS

A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2022.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for electric heat tracing.

C. Shop Drawings: Indicate electric heat tracing layout, electrical terminations, thermostats, controls, and branch circuit connections.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.

PART 2 PRODUCTS

2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

A. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).

B. Factory Rating and Testing: Comply with IEEE 515.1.

C. Heating Element:
   1. Provide pair of parallel No. 16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
   2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
   3. Capable of crossing over itself without overheating.

D. Insulated Jacket: Flame retardant polyolefin.

E. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.

F. Maximum Power-On Operating Temperature: 150 degrees F (65 degrees C).

G. Maximum Power-Off Exposure Temperature: 185 degrees F (85 degrees C).

H. Electrical Characteristics:
   1. 8 W/lineal ft (_____ W/lineal m).
   2. 120 volts, single phase, 60 Hz.

2.02 OUTER JACKET MARKINGS

A. Name of manufacturer, trademark, or other recognized symbol of identification.

B. Catalog number, reference number, or model.

C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

2.03 CONNECTION KITS

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Furnish with NEMA 4X rating for prevention of corrosion and water ingress.

2.04 ACCESSORIES

A. Provide Accessories As Indicated or As Required for Complete Installation, Including but Not Limited To:
   1. High temperature, glass filament tape for attachment of heating cable to metal piping.
   2. Heat-conductive putty.
   3. Cable ties.
   4. Silicone end seals and splice kits.
   5. Installation clips.

2.05 CONTROLS

A. Pipe Mounted Thermostats:
   1. Remote bulb unit with adjustable temperature range from 30 to 50 degrees F (minus one to 10 degrees C).
   2. Snap-action, open-on-rise, single pole switch with minimum current rating adequate for the connected cable.
   3. Remote bulb on capillary, resistance temperature device (RTD) or thermistor for direct sensing of pipe wall temperature.
   4. Control Enclosure: Corrosion resistant and waterproof.

B. System Controller:
   1. NEMA EN 10250 Type 4X enclosure.
   2. Microprocessor based.
   3. User interface with status indicator lights.
   4. BACnet connectivity via gateway.
   5. Diagnostic self-testing with field-adjustable testing interval.
   6. Ground fault equipment protection (GFEP) complying with UL 1053.
   7. Available Control Modes:
      a. ON/OFF.
      b. Ambient proportional.
   8. Manual ON/OFF override control.
   9. Dry contact for alarm reporting.
   10. Alarms:
      a. Ground fault.
      b. Sensor failure.
      c. Low temperature.
      d. High temperature.
      e. Low current.
      f. High current.
      g. Communications loss.
      h. Power loss.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.02 PREPARATION

A. Clean all surfaces prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with all national and local code requirements.

E. Identification:
   1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft (6 m) including cladding over each valve or other equipment that may require maintenance.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform start-up by factory technician, factory representative, or _____ as per Owner's requirements.

C. Field Testing and Inspections:
   1. Commission system in accordance with installation and operation manual.
   2. Inspect for sources of water entry and proper sealing.
   3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
   4. Minimum Acceptable Insulation Resistance: 20 megohms or greater at a test voltage of 2500 VDC for polymer insulated trace heaters.
   5. Test heating cable integrity with megohmmeter at the following intervals:
      a. Before installing the cable.
      b. After cable has been installed onto the piping.
      c. After the installation of thermal insulation onto the piping.
      d. Prior to initial start-up (commissioning).
   6. Measure voltage and current at each unit.
   7. Controls:
      a. Verify control parameters are set to the application requirements.
      b. Verify factory provided digital temperature controller is correctly configured with the building automation system.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

D. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

2.02 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:
    a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
    b. Mason Industries: www.mason-ind.com/#sle.
    c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
    d. Vibro-Acoustics: www.vibro-acoustics.com/#sle.
2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
    a. Color code or otherwise identify springs to indicate load capacity.
    b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
    c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
    d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
    e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
    f. Selected to function without undue stress or overloading.

C. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
    a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
    b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.
    c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Housed Spring Isolators:
    a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
    b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
    c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
    d. Furnished with integral leveling device for positioning and securing supported equipment.
3. Spring Isolator Hangers, Nonseismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
   1. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   2. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   5. Adjust isolators to be free of isolation short circuits during normal operation.
   6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Heat Transfer Equipment: Nameplates.

F. Major Control Components: Nameplates.

G. Piping: Tags.

H. Pumps: Nameplates.

I. Small-sized Equipment: Tags.

J. Tanks: Nameplates.

K. Valves: Tags and ceiling tacks where located above lay-in ceiling.

L. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.

E. Color code as follows:
   1. Heating and Cooling: Green with white letters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
   1. Identify service and flow direction.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Identification and types of measurement instruments to be used and their most recent calibration date.
      d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      e. Final test report forms to be used.
      f. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
      g. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.
   6. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.

e. Project location.
f. Project Architect.
g. Project Engineer.
h. Project Contractor.
i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:
a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
4. Duct systems are clean of debris.
5. Fans are rotating correctly.
6. Fire and volume dampers are in place and open.
7. Access doors are closed and duct end caps are in place.
8. Air outlets are installed and connected.
9. Duct system leakage is minimized.
10. Hydronic systems are flushed, filled, and vented.
11. Pumps are rotating correctly.
12. Proper strainer baskets are clean and in place.
13. Service and balance valves are open.

B. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.04 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Effect system balance with automatic control valves fully open to heat transfer elements.

D. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Water Tube Boilers.
   3. Air Cooled Water Chillers.
   4. Fan Coil Units.
   5. Air Handling Units and DOAS Unit.
   6. Exhaust Fans.
   7. Air Terminal Units.
   8. Air Inlets and Outlets.
   9. Split System Units.

3.08 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.
   6. Service factor.
   7. Sheave Make/Size/Bore.

B. V-Belt Drives:
   1. Identification/location.
   2. Required driven RPM.
   3. Driven sheave, diameter and RPM.
   4. Belt, size and quantity.
   5. Motor sheave diameter and RPM.
   6. Center to center distance, maximum, minimum, and actual.

C. Pumps:
   1. Identification/number.
   2. Manufacturer.
   3. Size/model.
   4. Impeller.
   5. Service.
   6. Design flow rate, pressure drop, BHP.
   7. Actual flow rate, pressure drop, BHP.

8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Combustion Equipment:
1. Boiler manufacturer.
2. Model number.
3. Serial number.
4. Boiler entering water temperature, design and actual.
5. Boiler leaving water temperature, design and actual.
6. Boiler pressure drop, design and actual.
7. Boiler water flow rate, design and actual.
8. Ambient temperature.

E. Chillers:
1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Evaporator entering water temperature, design and actual.
7. Evaporator leaving water temperature, design and actual.
8. Evaporator pressure drop, design and actual.
9. Evaporator water flow rate, design and actual.

F. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Air pressure drop, design and actual.

G. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.

12. Air pressure drop, design and actual.

H. Supply/Return Air/Outside Air:
1. Identification/location.
2. Design supply air flow.
3. Actual supply air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.

I. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Sheave Make/Size/Bore.
8. Number of Belts/Make/Size.
9. Fan RPM.

J. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.

K. Flow Measuring Stations:
1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Actual/final flow rate.
9. Station calibrated setting.

L. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. K-Factor.
8. Minimum heating and cooling design air flow.
9. Maximum design heating and cooling air flow.
10. Minimum actual heating and cooling air flow.
11. Maximum actual heating and cooling airflow.

M. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Design air flow.
6. Test (final) air flow.
7. Percent of design air flow.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville: www.jm.com/#sle.
   3. Knauf Insulation; Performance+ Duct Wrap: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Indoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville: www.jm.com/#sle.
   3. Knauf Insulation; Earthwool Insulation Board: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.

B. Insulation: ASTM C612; rigid, noncombustible.
   1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.04 JACKETING AND ACCESSORIES

A. For ductwork inside Mechanical Rooms: Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.

2.05 DUCT LINER

A. Manufacturers:
   1. Aeroflex USA: www.aeroflexusa.com/#sle.
   2. Armacell LLC: www.armacell.us/#sle.

B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Fungal Resistance: No growth when tested according to ASTM G21.

4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
5. Minimum Noise Reduction Coefficients:
   a. 1 inch (25 mm) Thickness: 0.40.
6. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) when tested in accordance with ASTM C1071.
7. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor) ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.

C. Transfer Ducts Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.02 SCHEDULES

A. Concealed, round or flat oval supply air, return air, outside air, and relief air ducts: Mineral Fiber-Blanket 2" thick with vapor barrier, installed R-value equal to 6.

B. Concelaed rectangular supply air, return air, outside air, and relief air ducts:
1. Mineral Fiber-Blanket 2" thick with vapor barrier, installed R-value equal to 6.
2. Mineral Fiber-Board 2" thick with vapor barrier, installed R-value equal to 6.

C. Lined Transfer Ducts: 1" Elastomeric Insulation.

D. All ducts exposed in Mechanical Rooms: Glass cloth field-applied jacketing.

END OF SECTION

SECTION 230716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

E. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

G. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Owens Corning Corporation; SOFTR Duct Wrap FRK: www.owenscorning.com/en-us/#sle.

B. Insulation: ASTM C553; flexible, noncombustible.
   1. K (Ksi) Value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 1,000 degrees F (538 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   1. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   2. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Knauf Insulation; Earthwool Insulation Board: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.

B. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.
   1. K (Ksi) Value: 0.25 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Density: 8.0 pcf (128 kg/cu m).

C. Aluminum-Foil Laminate Jacket:
   1. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Aeroflex USA; AEROFLEX EPDM Sheet/Roll: www.aeroflexusa.com/#sle.
   2. Armacell LLC; AP ArmaFlex: www.armacell.us/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic:
   1. Jacket: Sheet material, off-white color.
      a. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature; insulate entire system.

G. Fiber glass insulated equipment containing fluids below ambient temperature; provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

H. For hot equipment containing fluids over 140 degrees F (60 degrees C), insulate flanges and unions with removable sections and jackets.

I. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

J. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.02 SCHEDULE

A. Heating Systems:
   1. Expansion Tanks:

B. Cooling Systems:
   1. Pump Bodies:
   2. Air Separators:
   3. Expansion Tanks:
   4. Buffer Tanks:

END OF SECTION

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Johns Manville Corporation: www.jm.com/#sle.
3. Knauf Insulation; Performance+ Earthwool 1000 Pipe Insulation: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.owenscorning.com/en-us/#sle.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 850 degrees F (454 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/(Pa s m)).

D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
1. Aeroflex USA; AEROFLEX Self-Seal: www.aeroflexusa.com/#sle.
2. Armacell LLC; AP ArmaFlex: www.armacell.us/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 180 degrees F (82 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
b. Maximum Service Temperature: 150 degrees F (66 degrees C).
c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil, 0.010 inch (0.25 mm).
e. Connections: Brush on welding adhesive.

B. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Finish: Embossed.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.02 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return for sizes up to and including 1-1/2": Mineral-fiber, 1-1/2" thick.
   2. Heating Water Supply and Return for sizes 2" and over: Mineral-fiber, 2" thick.

B. Cooling Systems:
   1. Chilled Water Supply and Return: Miner-fiber, 1-1/2" thick.
   2. Condensate Drains from Cooling Coils: Mineral-fiber, 3/4" thick.

C. Other Systems:
   1. Refrigerant Suction Lines Piping: Separately insulate with 3/4" closed cell elastomeric insulation with vapor barrier. Provide embosssed aluminum jacketing for piping exposed to weather.
   2. Piping Exposed to Weather / Freezing with Heat Tracing: Mineral-fiber, 2" thick with embossed aluminum jacketing.

END OF SECTION

SECTION 230900
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Automation System (BAS), utilizing direct digital controls. (ASCENT)

1.02 REFERENCE STANDARDS

A. IEC 60870-5-104 - Telecontrol Equipment and Systems – Part 5-104: Transmission Protocols – Network Access for IEC 60870-5-101 Using Standard Transport Profiles; 2006, with Amendment (2016).

B. IEC 61131-3 - Programmable Controllers - Part 3: Programming Languages; 2025.

C. IEC 62443-3-3 - Industrial Communication Networks – Network and System Security – Part 3-3: System Security Requirements and Security Levels; 2013 (Corrigendum 2014).

D. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2026.

H. OPC UA - OPC Unified Architecture Specification; Current Edition.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

L. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

M. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

N. UL 60730-1 - Standard for Safety Automatic Electrical Controls – Part 1: General Requirements; Current Edition, Including All Revisions.

O. UL 62368-1 - Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements; Current Edition, Including All Revisions.

P. Building Automation System (BAS), utilizing direct digital controls. (ASCENT)

1.03 RELATED WORK

A. Native BACnet-based system, with Microsoft Windows 10 compatible operator's workstation. Workstation, building controllers, application controllers, and input/output devices communicate using protocols and network standards per ANSI/ASHRAE Standard 135, BACnet. Workstations, controllers, and unitary controllers, to be native BACnet. Do not use gateways for controller communication. Gateways may be used to communicate with existing systems or systems installed under other sections.

1. BACnet-compliant hardware and software meeting system's functional specifications. Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system.
2. Individual hardware layouts, interconnection drawings, and software configuration from project design data.
3. Implement detailed design for analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

4. Design, provide, and install equipment cabinets, panels, data communication network cables needed, and associated hardware.
5. Interconnecting cables between supplied cabinets, application controllers, input/output devices, operator's terminals and peripheral devices (including but not limited to printers) supplied under this section.
6. Manufacturer's specifications for items supplied.
7. Specialists and technicians; assist installation, startup, and commissioning.
8. Operator and technician training program as described herein.
9. As-built documentation, operator's terminal software, diagrams, and associated project operational documentation (such as technical manuals) on approved media accurately representing the final system.
10. New sensors, dampers, valves, and new electronic actuators. No used components.
11. Owner will have full licensing and access rights for network management and operating workstation features for ongoing maintenance and operation of BMS.
12. BMS workstation will host graphic files for control system. Graphics and navigation schemes for project are to match any that are on existing site/campus.

1.04 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   1. ASHRAE 90.1-2016, "Energy Efficient Design of New Buildings"
   2. ASHRAE 62.1-2013, "Ventilation for Acceptable Indoor Air Quality"
   3. ASHRAE 189.1-2011, "Standard for the Design of High-Performance, Green Buildings"
   4. ASHRAE 135-2016 " BACnet®"
   5. ASHRAE 55-2013, "Thermal Environmental Conditions for Human Occupancy"

B. American National Standards Institute (ANSI): ANSI/ASHRAE Standard 135, BACnet.

C. Underwriters Laboratories:
   1. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
   2. UL 864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.
   3. UL 2043 Underwriters Laboratories Standard for installation in air handling spaces and plenums

D. Electromagnetic Compatibility (EMC): EMC Directive 89/336/EEC (European CE Mark).

E. The Federal Communications Commission (FCC): FCC Part 15, Subpart J, Class A.

F. National Electrical Code (NEC).

1.05 SPECIFICATION NOMENCLATURE AND DEFINITIONS

A. Acronyms Used in this Specification:
   1. ACM: Ascent Control Module.
   2. Actuator: Device that opens or closes valve or damper in response to control signal.
   3. AI: Analog Input.
   4. AO: Analog Output.
   5. Analog: Continuously variable state over stated range of values.
   6. BAS: Building Automation System.
   7. BMS: Building Management System
   8. Compass: Alerton Workstation Software.
   9. DDC: Direct Digital Control.
   10. FC: Fail closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
   11. FO: Fail open position of control device or actuator. Device moves to open position on loss of control signal or energy source.
   12. GUI: Graphical User Interface.
   13. HMI: Human Machine Interface.

14. HVAC: Heating, Ventilating and Air Conditioning.
15. LAN: Local Area Network.
16. MSDB - Microsoft SQL Database
17. Modulating: Movement of control device through an range of values, proportional to an infinitely variable input value.
18. Motorized: Control device with actuator.
19. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
20. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
21. Operator Workstation: PC running Compass software and any required software tools applicable for day to day operation of the BMS.
22. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
23. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
24. PICS: BACnet Product Interoperability Compliance Statement.
25. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).
26. Point: Analog or discrete instrument with addressable database value.
27. VLC: VisuaLogic® Controller.
28. WAN: Wide Area Network.

1.06 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Construction details, layout, and location of control panels within building, including instrument location in panels and labelling. Indicate mechanical equipment associated with each controller and area in building being served by that equipment. For terminal unit control, a room schedule listing mechanical equipment tag, room number of space served, address of DDC controller, and pertinent information required for service.
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Shop Drawings: Material details, construction, finish and adjacent construction relationship.
   1. Engineering drawings, control sequence, and bill of materials for approval.
   2. Standard Sizes for Drawings: 11 inches x 17 inches (ANSI B) in PDF form.

D. System Documentation: Include the following in submittal package.
   1. System Configuration Diagrams: Simplified block format. Note software addressing for device communications for devices. Indicate locations of ethernet switches.
   2. Input/output object listings and an alarm point summary listing.
   3. Electrical drawings showing system internal and external connection points, terminal block layouts, and terminal identification.
   4. Bill of materials, valve schedule, and damper schedule.
   5. Instructions and drawings, for installation, operation, maintenance, preventive maintenance, troubleshooting, and spare parts for list control devices.
   6. BACnet Protocol Implementation Conformance Statements (PICS) per ASHRAE Standard 135: For system elements-Operator's Workstations, building controllers, application controllers, routers, and repeaters.
   7. Description and documentation of proprietary (non-BACnet) services and/or objects.

E. Project Management: Detailed project design and installation schedule with time markings and details for hardware items and software development phases.
   1. Target dates for transmission of project information and documents. Indicate timing and dates for system installation, debugging, and commissioning.
   2. Supply products to affected trades in time to prevent interruption of construction.
   3. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified. Five years documented experience.
   1. BAS System: Designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. Support facility within 2 hours response time of site with technical staff, spare parts, and test and diagnostic equipment.
   2. Contractor: Full-time, on-site, experienced project manager responsible for supervision of design, installation, start-up and commissioning or BAS.
   3. Materials and Equipment: Latest standard design complying with requirements.
   4. UL Listed under Standard UL 916, category PAZX: BAS peer-to-peer network controllers, central system controllers and local user displays.
   5. Electronic Equipment: Conform to requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
   6. Control System: Engineered, programmed and supported by representative's local office/ No less than four hour response, 24 hours a day, 7 days a week.

B. Installer Qualifications: Two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Each product type to be from a single manufacturing source.

1.08 PRE-INSTALLATION CONFERENCE

A. Convene approximately two weeks before scheduled Work commencement. Attendees to include Architect, Contractor and trades involved. Agenda: Include schedule, responsibilities, critical path items and approvals.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products in environmental conditions outside recommended limits.
   1. If ambient conditions are not met at time of delivery, manufacturer reserves the right to void the warranty.

1.11 WARRANTY

A. Manufacturer's Warranty: Limited warranty against defects in materials and workmanship. Covers costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance and applies equally to hardware and software.
   1. Personnel supporting the hardware and software warranty agreement will provide on- or off-site service in a timely manner after failure notification. Acceptable Response Time: Within 24 hours, Monday through Friday; 48 hours on Saturday and Sunday.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Allerton by Northwest Controls.

B. JCI or KMC by Harrison Energy Partners.

C. Siemens by Powers of Arkansas.

D. Trane by Trane of Arkansas.

2.02 SYSTEM DESCRIPTION

A. Except as indicated, system supplier to secure and pay for all permits, inspections, and certifications required for his work, and arrange for necessary approvals by the governing authorities.

B. BAS: Network of interoperable, stand-alone building controllers, field controllers on logical networks, graphics and programming for complete system.
   1. Password access to features, functions and data contained in BAS.
   2. Software for complete operating system, as specified, as integral part of supervisory controller. Not dependent upon higher level computer for execution.
   3. System Backup: Electronic copies of software, project graphics, setpoints, and system parameters. Backups will allow Owner to restore system if necessary.

C. Distributed Logic Control System: Software and hardware per ANSI/ASHRAE Standard 135.
   1. System controls mechanical equipment, including unitary equipment such as VAV boxes, heat pumps, fan-coils, AC units, air handlers, boilers, chillers, and listed equipment using native BACnet-compliant components.
   2. Operator's Workstation Software: BAS/BMS application written utilizing BACnet protocols. Software functions to include password protection, scheduling, alarming, logging of historical data, full graphics including animation, after-hours billing, demand limiting, and full suite of field engineering tools including graphical programming applications.
      a. Programming to make future changes to e system, controllers, field level devices, system changes, scheduling, and trending.
      b. Field engineering tools, graphical programming, graphical displays, and applications.
   3. Building Controllers: Building management software, with scheduling building control strategies and optimum start and logging.
      a. Energy Management Software/Firmware: Resident in field hardware.
      b. Operator's Terminal Software: Used to access field-based building management functions. Zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.
   4. Room Sensors: Viewable digital readout of room temperature, and outside air. Adjustable room setpoint within preset limits and set desired override time. Start and stop unit from digital sensor. Include wiring and firmware for field service mode allowing technicians to balance VAV zones and access parameters in zone controller directly from room sensor. Field service mode must have ability to be locked out.
   5. Application Controllers: Terminal units including VAV, HP and UV, air handler, central plant equipment, and other controlled equipment to be programmable. Mount next to controlled equipment. Communicate with building controller through BACnet LAN.

2.03 ADVANCED OPERATOR WORKSTATION – AOWS (COMPASS)

A. Structure of Workstation Interaction: Server/Client relationship. Embedded web server for client browser access. Server to archive and store system data. Virtualized server environment. Web clients may access archive server data.
   1. Single server license shall provide the ability to read/write, log, alarm, schedule and graphically display all physical and virtual points in a device – be it a BACnet Building Controller (B-BC), Advanced Application Controller (B-AAC), Application Specific Controller (B-ASC), BACnet Gateway, or any other BACnet device.
   2. Device licensing that limits the number of points accessible in a device, as described above in paragraph 2.3.A.1 shall not be accepted and will not be approved as an alternate.
   3. Licensing based on number of users or seats shall not be accepted and will not be approved as an alternate.

4. Single server license shall be provided for the following maximum connected devices.
    a. Maximum Devices to be Connected: 10.

B. Operator Workstation: General purpose, commercially available, computer.
1. Operating System: 64-bit – Windows 10/Server 2016/Server 2019
2. Processor: 2.5 GHz (or better), multi-core as required based on system size
3. Memory: 8 GB RAM (or higher) as required based on system size
4. Hard Drive: Minimum of 1 TB
5. Network Interface Card: 10/100/1000 Mbs.

C. Sufficient storage to accommodate fully configured point databases, application databases, graphics files, user-defined reports, and historical data archived as specified.

D. Graphic Based Displays: For each system.
1. Operator Workstation: Point data for each system. Update every 30 seconds.
2. Dynamically update data from any action by user.
3. Graphic Displays: Iconic graphic representations of mechanical equipment. Display graphic files, text, trendlog, and dynamic object data displays including animation.
4. Graphic Displays: "Drill Down" capability from main display to more specific system displays or navigation tree for building equipment and system diagnostic centric display organization.
    a. Tree Navigation Contents: Customizable per-user and per-user-group basis.
5. Systems with Terminal Unit Controls: Building floor plan with dynamic temperatures, drillable for more specific terminal information.
6. Points on graphics allow user to change field-resident Operator Workstation functions associated with project, including setpoints, weekly and exception schedules, from any screen, whether screen shows text or graphic display. Do without reference to object addresses or other numeric/mnemonic indications.
7. Protect display views unless operator credentials have proper access level. Assign access levels to each display/system object. Menu labels not to appear on graphic if operator does not have appropriate security level.
8. Analog objects: Displayed with operator modifiable units. Input objects may be displayed as graphic items on display screen as an overlay to the system graphic.
9. Information: Labeled with descriptors and shown with appropriate engineering units.
10. DDCs system must provide graphic displays and files. Systems requiring graphics development or logic programming are prohibited. Graphic Files: JPG, GIF or PNG.
11. Submit graphic displays to Owner for review and approval. Approved graphics to be in place prior to commissioning.
12. Operator Workstation: Supply graphics library, to use unaltered or modified. Include library to assemble custom graphics. System to allow creation of new graphics.
13. Data Displays: Ability to link to content outside of BAS system. Content to include, but not limited to launching external files in their native applications.

E. OmniGraphics: Graphics with custom geometry offering color gradient shading and variable opacity in scale to system variables; analog and binary, and color range settings.
1. OmniGraphics Must Support:
    a. Displaying current values in the geometric shapes.
    b. Geometric shapes to be clickable allowing navigation to another graphic display.
    c. Color Scale: Support using AVs and BVs to define the color scale ranges.

F. The Operator Interface: Support the following functions.
1. Mouse-over tooltip information of graphic items or data points; can be turned off.
2. Right mouse click access to context menu selection to create, view, or edit system functionality such as Schedule, Trendlogs, Alarms, Object Properties, and User Activity associated with display object selected.
3. Automatic zooming to screen size to maximize display to display area. Can be enabled or disabled. Background color, flood fills remaining screen background.

4. Support user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.

G. Password Protection: Preventing unauthorized use unless operator is logged on.
   1. Limits operator to assigned functions when logged on. Includes displays as outlined.
   2. Users: Individual User IDs, User Names, and Passwords. Case sensitive alphanumeric character entry except for User ID. User ID, User Name, and Password will enforce minimum of 8 characters and stored in encrypted format.
   3. Each user to be allowed individual assignment of control functions, menu items, navigation tree, and user-specific system start display, and restricted access to discrete BACnet devices to which user requires access.
   4. Passwords, user names, and access assignments: Adjustable via Compass. Password adjustable via web client.
   5. Users to have set access levels, which define access to displays and individual objects user may control. System to have 10 distinct access levels for assignment.
   6. Operator Workstation and Web Client: Auto logout feature when no keyboard or mouse activity is detected for time period, adjustable by system administrator. Enabled and disabled by system administrator. Screen message notifying log out.
   7. Permit effective date range, and effective time of day, User are permitted access.
   8. Active Directory Integration using LDAP for remote User Access control shall support to enforce minimum password length and enforce combination of the following requirements:
      a. Upper Case letters
      b. Lower Case letters
      c. Base 10 digits (0-9)
      d. Non-alphanumeric characters
      e. Password expiration
      f. User lockout after “x” failed attempts, where “x” is adjustable by the administrator

H. Operator Activity Log: Tracks operator changes and activities.
   1. Included in Operator Workstation. A log of what changed, who made the change, date and time of system activity, and value of change before and after. Operator may display activity, sort changes by user or operation and print Operator Activity Log.
   2. Activity log to be gathered and archived to MSDB as needed. Log to be able to exportable for spreadsheet display and sorting.
   3. User option to record commenting in Operator Activity Log upon system point change.
   4. Accessible via Web Client for viewing, sorting, filtering, and printing. Including via right mouse click and selection from context menu.

I. Standard Scheduling:
   1. Information to be in easy-to-read daily format including calendar of this month and next. Schedules to show actual ON/OFF times for day based on scheduling priority. Priority for Scheduling: Events, holidays and daily, with events being the highest.
   2. Holiday and Special Event Schedules: Display data in calendar format. Be able to schedule holidays and special events directly from these calendars.
   3. Operator to be able to change information for a given weekly or exception schedule if logged on with appropriate access privileges.
   4. Schedule Wizard for schedules set up. Walks user through schedule generation. Have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
   5. Scheduling: Include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and previous starts history. Individual zones to have optimum start time calculated based on parameters listed. Operators to input schedules to set time that occupied setpoint is to be attained. Optimum start feature must calculate the startup time needed to match zone temperature to setpoint. Operators to be able to set a limit for maximum startup time allowed.

6. List show currently defined schedules. Includes standard, holiday and event schedules. User to be able to select a list showing scheduled points and zones.
7. Display of schedules must show ON times for standard, holiday and event schedules in different colors on a given day. OFF times must also be shown in additional colors. Operators may select from a calendar what days are to be scheduled and show points and zones affected. Operators may set time for one day and then match it to days of the week to be affected as a recurrence of same schedule.
8. Any displayed data that is changeable by operator may be selected using the right mouse button and schedule selectable on screen. Selection of schedule using this method allows viewing of assigned schedule and allows the point to be scheduled.
9. Schedule Support Functions: Drag-n-drop events and holidays on schedule calendar.
    a. Drag-n-drop events default to two-hour period; can operator adjusted.
    b. Drag-n-drop holidays default for OFF all day; edit for multiple-day holidays.
    c. View affected zones when adding or editing timed events of a schedule.
10. Web Client: A search list of scheduled points and zones to access schedule calendar.
11. Schedule Time Blocks: Present schedule detail via mouse-over information.

J. Advanced Scheduling:
1. Hierarchy of schedulable resources shall be customized to meet owner/operator specific scheduling needs and requirements.
2. Schedulable resources shall support analog and binary data points, e.g. AV, AO, BV, BO objects.
3. Each schedulable resource shall have its own unique schedule object.
4. Holiday schedules shall support definition of a specific date or a perpetual holiday with a duration, for example the USA Thanksgiving two-day holiday.
5. Calendar events set to be reoccurring events shall support the following recurrence patterns:
    a. Repeat daily every x days or every weekday
    b. Repeat weekly every x weeks on selected days of the week
    c. Repeat monthly every x months on a specific date of the month or a specific day such third Saturday or last Monday.
    d. Repeat yearly every x years on a specific month and date or a specified day of a specified month, e.g. last Wednesday of November
6. Calendar events set to be reoccurring events shall support the following recurrence ranges: no end date, end after x occurrences, and end by a specified date.
7. Calendar events set to be reoccurring events shall support a custom recurrence setting that is a collection of specified random dates that may have no logical pattern.
8. Calendar events shall be configurable as a template that allows quick reuse and application by drag-and-drop onto any resource calendar. Any event shall be capable of being made into an event template.
9. Calendar events shall require the following parameters: Event Name, Event Type (binary or setpoint), Start Date/Time, and End Date/Time.
    a. Analog Event Type shall support selecting setpoint type to ensure that only compatible analog points are scheduled with a specified value
10. Calendar Events shall support selection of schedulable resources by inheritance to all child resources or by selection of specific resources. Each selected resource shall support setting a start and end offset of +/- 6 hours from event start start/end times.
11. The following conflict resolution rules shall be provided to determine what to do when schedulable resources have two events scheduled for the same time: Local vs. Inherited event; On vs. Off event; Newest vs. oldest event.

K. Alarm Indication and Handling
1. AOWS shall provide visual, printed, and email means of alarm indication. Printout of alarms shall be sent to the assigned network printer. Alarm notification can be filtered based on the User ID’s authorization level.

2. Alarm Manager shall provide log of alarm messages. History of alarm occurrences shall be archived to the data storage of the AOWS or a SQL data base. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, identification of operator acknowledging alarm, a comment form the operator who acknowledged the alarm, and the number of alarm occurrences.
3. Alarm Manager shall provide a means to filter all alarms that have been configured in the system for alarm description, current alarm state, default and customer date range, disabled/enabled, and priority level.
4. Alarm Manager shall provide a means to disable alarms for the purpose of performing maintenance without creating concern with unneeded alarm notifications.
5. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the AOWS user interface or through remote communication using email (Authenticated SMTP supported).
6. Alarm Manager shall provide the permissioned ability to Clear alarm occurrences from the Alarm Manager table while retaining the alarm in the AOWS database for reporting purposes.
7. Alarm Manager shall provide the permissioned ability to Purge alarm occurrences from the both the Alarm Manager table and the AOWS database.
8. Alarm Manager shall provide a user customizable navigation link from the Alarm message to the data display or template to the equipment associated with the alarm.
9. Alarm Manager shall provide a context menu that will allow for navigation to Schedule, Trendlog, Object Property display, or System (user) Activity from the Alarm points live data value.
10. AOWS shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting alarm setup.
11. User can silence audible annunciation for the current session.
12. User can disable auto-refresh of alarm annunciation for current session.
13. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or allow the creation of a new alarm.
14. Alarm Priority Levels (0-127) shall be definable in number and name. Alarms can be assigned to any of the priority levels defined.
15. The following Alarm data shall be displayed in the Alarm Management User Interface for each alarm:
    a. Number of times the alarm has occurred
    b. Average alarm duration (hours, minutes, and seconds) for the following transitions:
        1) Active to Normal
        2) Active to Acknowledgement
        3) Acknowledgement to Normal
    c. Actual alarm duration (hours, minutes, and seconds) for the following transitions for each alarm occurrence:
        1) Active to Normal
        2) Active to Acknowledgement
        3) Acknowledgement to Normal
    d. Live data point of point alarmed
    e. Navigation link to a user-selected display or URL
16. User Comment text shall be entered upon acknowledgement of an Alarm. The comment history is stored in the system data base and a user cannot edit or delete a comment after it has been submitted in the system.

17. Alarm Performance: An alarm annunciation shall appear on the AOWS user interface within 8 seconds and appear in the Alarm manager and data base within 10 seconds of a triggered alarm.

L. Trendlog Information: Display trendlog records in standard engineering units.
   1. Periodically gather data stored in building controllers and store information in system database. Append stored records with new data. Overwriting records is not allowed unless file size is limited. System database capable of storing 30,000 records before archiving data. Samples viewable at Web Client.
      a. Capable of trending on interval determined by polling rate, or change-of-value.
   2. Add and edit trendlogs and setup information including the following:
      a. The interval at which it is to be logged.
      b. Operations shall be password protected.
      c. Accessed directly from graphics on which a trended object is displayed.
   3. Trendlog Wizard: Setup of multiple trend logs simultaneously. Walk users through necessary steps. Have a pull-down selection for startup, or by right-clicking on value displayed on graphic, and then selecting Trendlogs from displayed menu.
   4. Trendlog Data: Viewable on Datalogger accessible via Web Browser. Trend logs of any point on a graphic must be initiated by performing a right mouse click on the point.

M. DataViewer access via Web Browser: Capable of graphing trend-logged object data.
   1. Access and ability to create, edit and view are restricted by user account credentials
   2. Specific and repeatable URL defines trendlog views for browser bookmarking and email compatibility.
   3. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
   4. Trendlog or Energy log and companion logs configurable to display on one of two independent vertical scales embedded in display.
   5. Click zoom for control of data set viewed along either graph axis.
   6. User-specifiable start and end dates and fast scroll features supporting click zoom of macro scale view of data for quickly finding data set based on visual signature.
   7. User export of the viewed data set to MS Excel.
   8. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

N. Energy Log Information: Display information in standard engineering units.
   1. Periodically gather energy log data in field controller and archive information. Append files with new data. Overwriting archived data is not allowed unless file size is limited.
   2. Store data in database format for use by third-party programs. System operation to stay online during graphing operations.
   3. Operators to be able to change energy log setup information. Includes meters, meter pulse value, and type of energy units. Meters monitored by system may be logged. Support using flow and temperature sensors for BTU monitoring.
   4. Web Client: Display data in tabular and graphical formats. Display in hourly, daily, weekly, monthly and yearly formats. Be able to select specific data periods to view.

O. Demand Limiting: Sheds and restores equipment based on energy usage when compared to shed and restore settings.
   1. Shedding: Implemented independently on each zone or piece of system equipment.
   2. Binary Shedding: 5 priority levels. Loads in a given priority level to be shed before any loads in a higher priority level are shed. Load shedding within a given priority level includes two methods; a "first off-first on" mode, and a "first off-last on" linear mode.
   3. Analog Shedding: Program generated ramp used by individual zones or control algorithm to raise and lower cooling and heating settings reducing energy usage.
   4. Status of each program to be displayed with description of each load on Web Client.

P. Reports: Capable of producing the following reports. Deliverable Format: CSV.
   1. Trendlog configurations.
   2. Alarm configurations.

3. Tenant activity configurations.
4. Device summary.
5. Energy log configurations.
6. Schedule configurations.
7. Deliverable Format: CSV files.

Q. Field Engineering Tools: For programming controllers supplied.
1. Database Application Manager: Include controller logic files and associated graphics.
2. Device Manager: Detect devices connected on BACnet network by scanning. Display device instance, network ID, model, and description. Record and display software file loaded in each controller. Store file copies in project folder on computer's hard drive.
3. Audit when device not in database is added to network.
4. Backup/restore function for system to selected medium. System to be capable of restoring systems and creating a backup for instantiating a new client PC.
5. A means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

R. Web Interface: System software based upon server/thin client architecture, designed around open standards of web technology.
1. Communicate using Ethernet and TCP. Access server using a web browser across Owner’s intranet and remotely via the Internet. Support 200 users with single license.
2. Web Browser: Microsoft Edge v95 or later, Firefox v70 or later, Chrome v95 or later, and Safari 13 or later. No special vendor-supplied software to be required. Display data in real-time. Update automatically without user interaction.
3. Web Pages: Automatically generated with HTML5 from data display files on Operator Workstation. Do not use systems requiring an HTML editor for web page generation.
4. Launching Web Browser on Operator Workstation presents a login page requiring a login name and password. Navigation and system adjustments dependent upon operators assigned privileges. User activity reports will show activity of operators, whether changes were made using a web client or Operator Workstation.
5. User Session Management including ability to view connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.

S. Context Menu Navigation: Web Browser: Support Context Menu Navigation via a right mouse click on a data point.
1. Operations to be dependent upon logged in user privileges and include:
a. View and setup Alarms.
b. View and setup Trend Logs.
c. Display the BACnet properties for the selected Object.
d. View and setup Schedules.
e. View System activity for the selected Object.

T. Summary Pages:
1. Present system data in tabular form. Data to be from multiple devices. Points presented horizontally and devices listed on left side of table.
2. Built using spreadsheet that can be imported into Operator Workstation.
3. Data in summary pages to be live. Configure each object to be read only or writeable.
4. Both analog and binary data shall be supported.
5. Summary page, when populated, captured for archiving and review for analysis.
6. The data shall be sortable by clicking on the column headings.

2.04 BUILDING CONTROLLER (ACM)

A. General Requirements:
1. BACnet Conformance: Approved by BTL as meeting BACnet Building Controller (B-BC) profile requirements as defined by BTL Revision 15.

a. Refer to ANSI/ASHREA 135, for a complete list of the services that must be directly supported to provide for the profile listed above.
b. Proprietary services, if used, shall be documented and provided as part of submittal data. Tools shall be provided for working with proprietary information.

2. Scalable: Number of trunks and protocols selectable to fit project requirements
3. Capable of panel-mounting on DIN rail and/or via mounting screws.
4. Global control strategies based on information from any objects in system, regardless if object is directly monitored by building controller module or by another controller.
5. Shall support configuration of 5 additional independent Building Controller Modules.
   a. Additional Building Controller Modules shall support configuration as a BACnet Global Controller, BACnet Expandable I/O Controller, Modbus/BACnet Gateway, or Proprietary Protocol/BACnet Gateway as defined herein.
   b. Each Building Controller Module supports running an independent DDC Program strategy.
   c. Independent DDC Program control strategies shall run simultaneously, and modification of one control strategy shall not interrupt function or runtime of any of the other running Independent DDC Program control strategies.
6. Software implementing DDC strategies shall be completely flexible and user definable.
7. Software Programming Tools: Shall be provided as part of project software. Factory pre-programmed global strategies not modifiable by field personnel are not acceptable. Changing global strategies via firmware changes is also unacceptable.
8. Programming: Object-oriented control function blocks and support DDC functions. Flowcharts: Generated and automatically downloaded to controller. Programming tool to be resident on workstation. This same tool shall be used for all controllers.
9. Graphically view inputs and outputs of each program block in real-time as program is executing. Function may be performed using operator's workstation or field computer.
10. Controller: 6,000 Analog Values and 6,000 Binary Values.
11. Controller IP configuration: Via direct USB connect or field computer.
12. Quad Core 996 Ghz processor to ensure fast processing speeds.
13. Execute control algorithms and automated control functions with 64-bit processor.
14. Minimum of 1 GB of DDR3 SDRAM on a 533 Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
15. Building Controller shall be provided with two on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to, BACnet MS/TP and Modbus.
16. Building Controller shall be provided with two independently configurable Ethernet ports. Both Ethernet ports shall be capable of supporting Ethernet speeds of 10Mbps, 100Mbps, and 1000Mbps. Both Ethernet ports shall support the following protocols at a minimum: BACnet/IPv4, BACnet/IPv6, Modbus TCP, TCP/IP, Lon/IP, and FOX.
17. Ports capable of having protocols assigned shall utilize the respective port's physical connection.
18. Building Controller shall be provided with a minimum of 2 binary (digital) inputs and 2 universal analog inputs selectable between 10K thermistor (Type II), 1k Platinum RTD (PT-1000), 0-10 VDC, 0-20 mA, and 0-10k Ohms. Each analog input shall be freely scalable, in real time, via a graphic user interface.
19. Schedules:
    a. Building Controller shall support normal seven-day scheduling, holiday scheduling and event scheduling.
    b. Building Controller shall support a minimum of 384 BACnet Schedule Objects and 384 BACnet Calendar Objects.
    c. Scheduling shall support Optimum Start Algorithm as defined herein.
    d. All Schedule Objects shall be individually configurable to write on a change of state or on a defined interval of 300 seconds minimum to 900 seconds maximum.
20. Logging Capabilities:

a. Building Controller shall support a minimum of 2,000 trendlogs. Any object in the system (real or calculated) may be logged. Trendlogs shall be individually configurable for interval time sampling or change of state sampling (binary objects) or change of value sampling (analog objects). Sample time interval shall be adjustable at the operator's workstation.
b. Building Controller shall support a minimum of 1,000 COV subscriptions, excluding analog objects with no COV_Increment property.
c. Viewed logs on-site or off-site using WAN or remote communication.
d. Periodically upload trended data to operator's workstation for archiving. Archived data available for use in spreadsheet or database programs.

21. Alarm Generation: Within the system for any object change of value or state, includes analog and binary object state changes, and controller communication failures.
a. Each alarm may be dialed out as noted elsewhere.
b. Provide alarm log for alarm viewing. Log may be viewed on-site at operator's terminal or off-site using remote communications.
c. Handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

22. Demand Limiting of Energy:
a. Building Controller shall support a minimum of 10 user-configurable Demand-Limiting/Load Shedding Controller modules.
b. Demand-Limiting/Load Shedding Controller modules shall support shedding of at least 1,200 analog and binary loads.
c. Demand-Limiting/Load Shedding Controller modules shall operate as defined herein.

B. BACnet MS/TP:
1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.2 Kbps
a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
b. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

C. BACnet IP and BACnet Ethernet:
1. The Building Controller shall, at a minimum, comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
2. The Building Controller shall be capable of being configured to communicate using the following BACnet communication protocols simultaneously:
a. BACnet/Ethernet.
b. BACnet/IPv4.
c. BACnet/IPv6.
3. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
4. Each controller shall support at a minimum 128 BBMD entries.
5. BBMD management architecture shall support 3,000 subnets at a minimum.
6. Shall support BACnet Network Address Translation.
7. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports:
1. Controller shall support two (2) expansion ports.
a. Combining the two on-board EIA-458 ports with fully loaded expansion ports, the controller shall support a maximum of six (6) EIA-485 trunks simultaneously.
2. Expansion Cards: Mate to the expansion ports, shall include the following.
a. Dual port EIA-485 card.

b. Single port EIA-232 card
c. 78 kbps FTT10A LON network card.

E. Modbus Protocol Support:
1. Controller shall support reading from and writing to TCP Slaves and Serial Connections (RTU or ASCI over either EIA-485 or EIA-232).
a. Shall be capable of mapping Modbus register coil data to BACnet AV, BV, MV, AI, BI, and MI object types.
b. Support a minimum of 6000 Mapped Modbus points.
c. Modbus over EIA-485 shall be software-configurable from 9.6 to 115.2 Kbps
2. Support up to 384 virtual groupings of Modbus points where each grouping is represented as a single virtual BACnet device.
a. Virtual BACnet devices support BACnet Change Of Value (COV) notifications
b. Each Virtual device has diagnostic information for troubleshooting Modbus point mapping. Diagnostic point should include the following.
1) Number of points mapped.
2) Number of messages Transmitted and Received.
3) Modbus Exception Counts.
4) Display of last exception message.
5) Serial Setting (Baud rate, Parity, Stop Bits).
3. Integration Performance:
a. Data age of integrated point shall be capable of 1 second for 5000 points.
b. Polling Interval shall be adjustable per Modbus Device, up to a maximum (fastest) polling interval of 1 second.
c. Maximum Registers per Message shall be adjustable per Modbus device within a range of 1 to 100.

F. Niagara Framework:
1. Controller shall utilize the Tridium Niagara Framework.
a. Niagara Framework shall be version N4.8 or newer.
b. Niagara licensing shall be stored on a removable MicroSD card for fast in-field replacement of controller.
2. The Niagara License for the controllers shall be an open license.
a. The controller shall be programmable via Niagara Workplace programming tool.
b. The controller shall be programmable via a Niagara embedded Workplace programming tool.

G. Power Supply:
1. Input for power: Accept between 17 and 30 VAC, 47 and 63 Hz.
2. Rechargeable Battery: For controller shutdown including flash memory data storage.
3. On-board capacitor ensuring continuous operation of real-time clocks for 14 days.

H. Controller: Shall be in compliance with the following.
1. UL 916 for open energy management.
2. FCC Class B.
3. RoHS Compliant.
4. IEC 60703.
5. C-Tick Listed.
6. CE(EN 60730-1).

I. Controller: Operate in the following environmental conditions.
1. Without Battery: Minus 4 to 149 degrees F (Minus 20 to 65 degrees C).
2. With Battery: 32 to 122 degrees F (0 to 50 degrees C).
3. Relative Humidity: 0 to 95 percent, non-condensing.

2.05 TERMINAL UNIT APPLICATION CONTROLLERS (VLC-E AND VAV-E)

A. General Requirements:

1. One native BACnet application controller (B-ASC) for each piece of unitary mechanical equipment that adequately covers objects listed in object list for unit.
2. Interface to building controller through MS/TP LAN using BACnet protocol. No gateways to be used. Controllers to include input, output and self-contained logic program as needed for complete control of unit.
3. Microprocessor-based, multi-tasking, real-time digital control processor. Each controller shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network.
4. Sufficient memory to support system setpoints, proportional bands, control algorithms, and other programmable parameters shall be stored such that a power failure of any duration does not necessitate any reprogramming. Each application controller shall return to normal operation upon restoration of power.
5. Setpoint and input/output point data shall be accessible through any operator workstation, web browser and building controllers.
6. Ability to download and upload configuration data via the operator workstation.
7. One copy of any programming tool required to configure or program the controllers shall be provided to the Owner along with appropriate documentation.
8. Include 16-bit universal inputs auto-selectable between 3K and 10K thermistors, 0-5 VDC 0-10 VDC, 0-20 mA, dry contact, and pulse inputs. A minimum of 3 pulse inputs shall be provided. Any input on controller may be either analog or binary (digital). Controller shall also include support and modifiable programming for interface to intelligent room sensor. Pulse input shall measure a maximum frequency of 100 Hz, with a minimum duty cycle timing of 5 mS on and 5mS off. Signal selection for universal inputs shall not require on-board jumpers or DIP.
9. Include binary outputs and/or analog outputs as needed for the application. Binary outputs shall be integral to the controller and rated 24 VAC @ 50/60 Hz, 500 mA continuous and 800 mA (AC rms) for 60 milliseconds. Analog outputs shall be 16-bit universal outputs auto-selectable 0-10 VDC @ 10mA maximum (1k ohm minimum) or 0-20mA @ 550 ohms maximum.
10. Ambient Space Rating : 0 to 158 degrees F and 5 to 95 percent RH.
11. Include support for intelligent room sensor. Display on room sensor to be programmable at controller and include an operating and field service mode. Button functions and display data to be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

B. BACnet Conformance:
1. As a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4, 76.8, and 115.2Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements and support BACnet services necessary to provide the following BACnet BIBBs:
    a. Data Sharing - DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B.
    b. Device and Network Management - DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, DM-RD-B.
2. Refer to ANSI/ASHRAE Standard 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. Proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
4. Application Controllers:

a. BACnet Protocol Implementation Statements per ANSI/ASHRAE Standard 135.
b. Conform to FCC Part 15, Subpart J, Class A.

C. Application Specific Controllers:
1. Support, but not limited to, the following system types to address specific applications: Rooftop Air Handlers and VAV terminal units.
2. Application Specific Descriptions:
a. Fan Coil Unit Controls:
1) Support, but limited to operational sequences described in Division 23.
2) Support the following input and output types:
(a) Modulated heating and cooling control outputs.
(b) Space temperature inputs.
(c) Analog space temperature setpoint adjustment inputs.
(d) Binary unoccupied override inputs.
3) Modes of operation supported by Fan Coil Unit Controllers:
(a) Daily/weekly schedules.
(b) Occupancy mode.
(c) Unoccupied mode.
(d) Temporary override mode.
b. Touch screen communicating thermostat programming shall:
1) Program sequences stored on board in Flash Memory.
2) No batteries needed to retain any program.
3) Program sequences executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices.
4) Support internal schedule with real time clock.
5) Support Peer-to-Peer programming.
6) Support lockout of touch screen with a pass code.
7) Programming Controller: Field modifiable over BACnet LANs or remotely with modem interface. Program using same tool as Building Controller and as described in operator's workstation section. Provide programming tools as part of system.

2.06 ELECTRONIC CONTROL DEVICES

A. Temperature Sensors (Microset 4): Solid-state electronic, interchangeable with housing appropriate for application. Wall sensors: Install as indicated on drawings. Mount 48 inches (1219 mm) above finished floor. Duct sensors: Install so sensing element is in the main air stream. Immersion sensors: Install in wells. Immersion wells to be filled with thermal compound before installation of immersion sensors. Outside air sensors: Install away from exhaust or relief vents, not in an outside air intake, and in a shaded location.

B. Intelligent Room Sensor with Touchscreen:
1. General Requirements:
a. Backlit touchscreen LCD digital display.
b. Temperature sensor.
c. Humidity sensor.
d. Programmable Status Light indicator.
e. CO2 sensor or BACnet MS/TP communication up to 115.2 kbps.
f. Interact with smart sensor using a touchscreen, with no buttons allowed.
g. Tamper proof installation requiring tools to be removed from the wall.
h. Touchscreen: Surface hardness of Mohs 7 or greater preventing scratching.
i. Controller: Function as room control unit, and allow occupant to raise and lower setpoint, and activate terminal unit for override use-all within limits as programmed by building operator.
2. Space Temperature Sensor: Uni-Curve Type II thermistor. Accuracy: Plus or minus 0.36 degrees F (0.3 degrees C) at calibration point over range of 32 to 158 degrees F.

3. Humidity Sensor: Accuracy: Plus or minus 3 percent from 10 to 90 percent relative humidity (RH) or better, non-condensing.
4. Status Light indicator: A minimum of 4 colors, blue, red, amber, and green. Will cast a glow onto wall below sensor to be used as visual indicator to occupants of system condition. Color and on/off state of Status Light indicator to be fully programmable.
5. CO2 Sensor: Accuracy: Plus or minus 30 ppm over range of 0 to 5000 ppm.
    a. Automatic Baseline Correction maintains calibration. No manual calibration.
6. Display Content:
    a. Intelligent room sensor:
        1) Simultaneously display room setpoint, room temperature, and outside temperature at each controller.
        2) Ability to add or remove time-of-day, room humidity, and indoor air temperature to customize view for customer. Must have the capability to show temperatures in degrees Fahrenheit or degrees Celsius.
        3) Display status of a lighting zone and control on/off state of zone from touchscreen using a tenant-accessible display page.
        4) Display status of window zone (e.g., blinds) and control on/off state of zone from touchscreen using a tenant-accessible display page.
    b. A communication loss or improper communications wiring to be displayed on the LCD screen to aid in trouble shooting.
    c. Firmware version information to be displayable on the LCD screen.
    d. Cleaning mode: Allow cleaning of touchscreen.
7. After Hours Override:
    a. Be set and viewed in 30-minute increments.
    b. Override countdown: Automatic, but can be reset to zero by from the sensor.
    c. The remaining time shall be displayed.
    d. Display "OFF" in unoccupied mode unless a function button is pressed.
8. Configuration Modes:
    a. Intelligent Room Sensor: Service technician access to hidden functions for advanced system configuration. Functionality accessed-protected with a configurable PIN number.
    b. Field Service Mode shall allow access to common parameters as dictated by application's sequence of operations. Parameters shall be viewed and set from intelligent room sensor with no computer or other field service tool needed.
    c. If the intelligent room sensor is connected to VAV controller, Balance Mode shall allow a VAV box to be balanced and air flow parameters viewed. The balancing parameters shall be viewed and set from the intelligent room sensor with no computer or other field service tool needed.
9. Conformance: Intelligent Room Sensor to be in compliance of the following:
    a. UL Standard for Safety 916.
    b. FCC Part 15.107 and 109, Class B, CFR47-15.
    c. EMC Directive 89/336/EEC (European CE Mark).

2.07 OPERATOR DISPLAY (ALERVIEW)

A. General Requirements:
1. 7-inch touchscreen display shall support in-wall flush on-wall surface tabletop, and panel door mounting.
2. Display shall be 7-inch IPS with a resolution of 104x600 and a brightness of 350nit; touch panel shall be capacitive screen with five points touch.
3. Microprocessor shall be ARM Cortex A7 dual core running at 1.2 GHz.
4. Memory shall include 2GB RAM and 4GB Flash
5. Power options shall include 110-24VAC via AC adapter, 9-30VDC direct, and PoE IEEE 802.3af (15.4W, 48V)

6. Communications shall support Ethernet 10/100 and EIA-485 over TSP with manual settings of 9.6, 19.2, 38.4, 76.8, and 115.2 kbps.
7. Network protocols supported shall include BACnet/IP, BACnet/MSTP, DHCP, and ICMP Type 8 and Type 0.
8. IP addressing shall be selectable between Automatic (DHCP) and Manual (static).
9. BACnet/IP addressing shall include setting of the Device Object properties (instance, name, description, location); UDP Port; and BBMD IP address and UDP port for registering as a foreign device.
10. BACnet/MSTP addressing shall include setting of the MAC address and baud rate.

B. Display Configuration and Capabilities
1. Display shall provide the following user configurable content.
   a. Home Screen with background image in PNG format @ 1024x600mm, logo image in PNG format @ 48x48mm, and up to six featured point tiles.
   b. Device Tiles in the following formats: single (1 featured point), tall (4 featured points), quad (8 featured points), and full screen (12 featured points).
   c. Point Tile Templates shall provide for the display of up to six data point tiles per screen. Multiple screens shall be supported, with navigation between screens by user swipe left and right as well as by jump-to-screen via screen designator.
2. BACnet Point Objects
   a. The following BACnet point objects shall be supported: analog input, analog output, analog value, binary input, binary output, and binary value.
   b. BACnet point object properties supported shall include present value and priority array index.
3. Point Properties
   a. For each point the following properties shall be provided: Tile; Object Type; Object Instance; Read Only; Access Level; Write Priority; Decimal Display; Binary Active text; Binary Inactive text; Relinquish text; Engineering Unit.
4. User Configurations
   a. Support for a maximum of 999 users shall be provided.
   b. Each user shall be configured with the following: unique user ID, name, access level.
   c. Ten levels of user access shall be provided.
   d. Each user shall be provided with private password PIN
   e. User activity shall be logged with date/time stamp for the following activities: logging on/off, changing a point value with old value/new value, change of configuration, and updating display firmware.
   f. Admin User shall have access to the settings menu for management of users and device configuration.

2.08 INTERCONNECTING WIRE AND CABLE

A. Wiring regardless of service or voltage will comply with Contract Document Division 16 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ).

B. Where required, wiring, regardless of service or voltage, to be in conduit per Division 16 and routed parallel to or at right angles with the structure. Properly support every 6 ft (1829 mm).

C. Where permitted by local guides, NEC and AHJ; use plenum-rated control cabling where final application will be concealed but accessible. Where plenum-rated cable is allowed, route parallel to or at right angles with the structure. Support every 6 ft (1829 mm).

D. The BAS Wiring:
1. 24 VAC Power: Red/Black jacketed conductors; black jacketed sheath over the pair.
2. Input/Output – White/Black jacketed conductors; white jacketed sheath over the pair.
3. Communication: White/Black jacketed conductors; blue jacketed sheath over the pair.

2.09 ELECTRONIC ACTUATORS AND VALVES

A. Quality Assurance for Actuators and Valves:
   1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
   2. NEMA 2 rated enclosures for inside mounting. Weather shield for outside mounting.
   3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves:
   1. Freeze-stat and "Hard Wire" interlock to disconnect mechanical spring return actuator power circuit; fail-safe operation. Do not use control signals to drive actuators closed.
   2. DDC analog output points to have an actuator feedback signal, independent of control signal, wired and terminated in control panel for true position information and troubleshooting. Or wire the actuator feedback signal to DDC as an analog input for true actuator position status.
   3. VAV box damper actuation to be floating type or analog (2 to 10 VDC, 4 to 20 mA).

C. Actuators for damper and control valves 0.5 to 6 inches (13 to 152 mm). Electric unless otherwise specified. Provide as follows:
   1. UL Listed Standard 873 and Canadian Standards association Class 481302.
   2. Enclosures: NEMA 2 rated for inside mounting. Weather shield for mounting outside.
   3. Five-year manufacturer's warranty. Two-year unconditional and Three year product defect from date of installation.
   4. Mechanical Spring: When specified. Do not use non-mechanical fail-safes.
   5. Position indicator device installed visible to exposed side of actuator. For damper short shaft mounting, provide a separate indicator to exposed side of actuator.
   6. Overload Protection: Protection against burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit to insure actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate actuator at end of rotation are acceptable for butterfly valve actuators.
   7. A Pushbutton gearbox release shall be provided for non-spring actuators.
   8. Modulating actuators shall be 24 VAC and consume 16 VA power or less.
   9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators:
   1. Outside air and exhaust air damper actuators: Mechanical spring return. Do not use non-mechanical forms of fail-safes. Mounting arrangement and spring return feature to permit normally open or normally closed positions of damper.
   2. Economizer Actuators: Analog control 2-10 VDC. Floating control is not acceptable.
   3. Electric damper actuators (and VAV box actuators): Direct shaft-mount. Use V-bolt and toothed V-clamp for positive gripping.
   4. One electronic actuator direct shaft-mounted per damper section. No connecting rods or jackshafts. Small outside and return economizer dampers may be mechanically linked if one actuator has sufficient torque to drive both horizontal drive shafts.
   5. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft-mounted per damper section. (See below execution section for more installation details.)

E. Valve Actuators: 0.5 to 6 inches (13 to 152 mm).
   1. Mechanical spring on actuators for pre-heat coil and actuators for AHU heating or cooling coil for outside mounted units. Fail-safe flow function: Normal Open or Normal Closed. Capacitors or non-mechanical forms of fail-safe are not acceptable.
   2. Zone service actuators: Non-spring return unless otherwise specified.
   3. Provide minimum torque required for proper valve close-off for required application.
   4. Control valves actuators: Attached 3-foot cable for easy installation to a junction box.
   5. Override handle and gearbox release for non-spring return valve actuators.

F. Control Valves: Size varies based on valve type.

1. Furnish specified motorized control valves, actuators, and control wiring to actuators. Equal percentage control characteristic for water coil control valves. Linear characteristic is acceptable for 3-way valves 2.5 inches (64 mm) and above.
2. Characterized Control Valves: For hydronic heating or cooling and small to medium AHU water-coil applications, and Unitary equipment and closed loop application. Actuators: Non-spring return for terminal unit coil control unless otherwise noted. If coil is exposed to outside air stream, see plans for spring return requirement.
    a. Leakage: ANSI Class IV seat leakage. Differential wrt Close-off: Differential close-off pressure shall be at least 40 psid for 3-way valves and 100 psid for 2-way valves
    b. Valves 0.5 to 2 inches (13 to 51 mm): Forged brass body. NPT screw type connections. Valve sizes varies from 0.5” to 3” with threaded 2way & 0.5” to 2.5” with 3way.
    c. Valves threaded connection 0.5 to 3 inches (13 to 32 mm): ANSI Class 600 working pressure.
    d. Operating Temperature Range: 0 to 250 degrees F.
    e. Stainless steel ball/Nickel-plated brass ball and stem furnished on modulating valves.
    f. Seats to be fiberglass reinforced Teflon.
    g. Two- and three-way valves: Equal percentage control port. Full stem rotation is required for maximum flow to insure stable BTU control of coil.
    h. Three-way valve to be applicable for both mixing and diverting.
    i. Characterizing Disc: TEFZEL; keyed and secured by retaining ring.
    j. Stem: Blow-out proof. Stem Packing: 2 lubricated O-rings for on-off or modulating service and to require no maintenance.
    k. The valves shall have an ISO type, 4-bolt flange for mounting actuator in any orientation parallel or perpendicular to the pipe All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards
    l. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class IV, minimum.
    m. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50mm) of pipe insulation and provide a torque of a least 27 lb-in for valves up to 1 ¼ inches and a torque of at least 44 lb-in for valves up to 3 inches.
3. Globe valves: 0.5 - 2 inches threaded (13 mm - 51 mm) shall be used for steam control (100psi pressure), water, and glycol solutions (up to 50 percent concentration)
    a. Valves shall be red brass body, NPT screw type, and shall be rated for ANSI Body Class 150
    b. Valves 0.5 inches (13 mm) (DN15) through 2 inches (51 mm) (DN50) with seat leakage rate (≤0.05 percent of CV) with Maximum Water Close off: 230 psid (also depends on actuator torque).
    c. The operating temperature range shall be 36-337 degrees F.
    d. Threaded valve Packing: Spring-loaded, carbon fiber reinforced PTFE V rings
    e. Two-way & Three way mixing valves shall have an equal percentage control port.
    f. Three-way valves shall have a linear control and bypass port.
    g. Mixing and diverting valves must be installed specific to the valve design.
4. Globe Valve: 2.5 to 6 inches (64 to 152 mm) (DN65 to DN50)
    a. Body: ANSI Class 125 and Class 250 flanged cast iron bodies. Differential pressure of 175 psi, ANSI Class IV leakage on pressure-balanced models, 0.05% of Cv (ANSI Class III) for 2way, <0.1% of Cv ANSI Class III for 3way.
    b. Flow Type, 2-Way, 3-Way Mixing: Equal percentage. Flow Type 3-Way Diverting: Linear.
    c. Mixing and Diverting Valves: Installed specific to valve design.
5. Butterfly Resilient Seat Valves: Sized for modulating service at 60 to 70 degree stem rotation.

a. Isolation valves to be line-size. Design velocity: Less than 12 ft (3658 mm) per second when used with standard EPDM seats.
b. Body is Polyester coated ductile iron
c. Disc is 304 Stainless steel
d. Seat is Reinforced EPDM.
e. Cold working pressure 232psi, body pressure rating consistent with ASME/ANSI Class 125, Media temp -22 °F to 250 °F.
f. Flange is ASME/ANSI class 125/150 flanges
g. Maximum Differential Pressure: 200 psi for 2 inches to 12 inches, 150psi 14 inches to 24 inches

6. Butterfly Valve Industrial Actuators:
   a. CE Compliant, Underwriters Laboratories, Inc - C/US Listed up to 12 in. Assemblies, Canadian Standards Association - C/US Certified, 14 in. and larger assemblies for 2way resilient and CE - Compliant Underwriters Laboratories, Inc C/US UL873 for 3way resilient butterfly valve. Enclosure: NEMA 2 & NEMA 4 (weatherproof). CE - Compliant Underwriters Laboratories, Inc C/US Listed, up to 6 in. assemblies Canadian Standards Association C/US Certified, 8 in. and larger assemblies for High performance 2way, CE - Compliant Underwriters Laboratories, Inc C/US Listed, up to 4 in. assemblies Canadian Standards Association C/US Certified, 5 in. and larger assemblies for 3way High performance Valves.
   b. Continuous Duty Motor: Fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1 pH, 60 Hz supply. Provide two adjustable cam-actuated end travel limit switches controlling travel direction. Self-resetting thermal switch imbedded in motor for overload protection.
   c. Two adjustable SPDT cam-actuated auxiliary switches, rated at 250 VAC for indication of open and closed position.
   d. Heater to minimize condensation within actuator housing.
   e. Hand crank: For manual override of actuator to operate valve during power failure or system malfunction. Permanently attached to actuator. When in manual operation electrical power to actuator must be permanently interrupted. Hand wheel will not rotate while actuator is electrically driven.
   f. The actuator shall be analog, floating, or two position as called out in the control sequence of operation. Analog valves shall be positive positioning, and respond to a 2 to 10 VDC, 4 to 20 mA, or adjustable signal as required. Analog actuators shall have a digital control card allowing any voltage input for control and any DC voltage feedback signal for position indication.
7. Performance Verification Test:
   a. Control loops Cause productive actuation with each actuator movement. Actuators to modulate at rate that is stable and responsive. Actuator movement is not occur before effects of previous movement have affected sensor.
   b. Actuator to be capable of signaling a trouble alarm when actuator Stop-Go Ratio exceeds 30 percent.
   c. Actuator mounting for damper and valve arrangements; comply to the following:
   d. Damper actuators: Shall not be installed in the air stream
   e. A weather shield shall be used if actuators are located outside. For damper actuators, use clear plastic enclosure.
   f. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary.
8. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.

9. Damper mounting arrangements: Comply to the following:
    a. Ventilation Subcontractor: Furnish/install damper channel supports and sheet metal collars.
    b. No jack shafting of damper sections shall be allowed.
    c. Multi-section dampers shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per section.
10. Size damper sections based on actuator manufacturer's specific recommendations for face velocity, differential pressure and damper type. In general:
    a. Damper section shall not exceed 24 ft-sq. with face velocity over 1500 FPM.
    b. Damper section shall not exceed 18 ft-sq. with face velocity over 2500 FPM.
    c. Damper section shall not exceed 13 ft-sq. with face velocity over 3000 FPM.
11. Multiple section dampers of two or more shall be arranged to allow actuators to be direct shaft mounted on the outside of the duct.
12. Multiple section dampers of three or more sections wide to be arranged with a 3-sided vertical channel (WxD) 8 x 6 inches (203 x 152 mm) within duct or fan housing and between adjacent damper sections. Vertical channel to be anchored at top and bottom of fan housing or building structure for support. Sides of each damper frame to be connected to the channels. Holes in channel allow damper drive blade shafts to pass through channel for direct shaft-mounting of actuators. Face open side of channel downstream of airflow, except for exhaust air dampers.
13. Multiple Section Dampers: Mount flush within a wall or housing opening and receive vertical channel supports as described above or sheet metal standout collars. Sheet metal collars, 12 inches (305 mm), must bring each damper section out of the wall to allow direct shaft-mounting of actuator on side of the collar.
14. Valve Sizing for Water Coil:
    a. On/Off control valves shall be line size.
    b. Modulating control valve body size may be reduced, at most, two pipe sizes from the line size or not less than half the pipe size. The BAS contractor shall size water coil control valves for the application as follows:
        1) Booster-heat valves shall be sized not to exceed 4-9 psi differential pressure. Size valve for 50 percent valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
        2) Primary valves: Sized not to exceed 5-15 psi differential pressure. Size valve for 50 percent valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
15. Butterfly valves: Size for modulating service; 60-70 degree rotation. Design velocity: 12 feet (3658 mm) per second or less when used with standard EPDM seats.
    a. Valve mounting arrangements shall comply to the following:
        1) Unions shall be provided on ports of two-way and three-way valves.
        2) Install three-way equal percentage characterized control valves in a mixing configuration with the "A" port piped to the coil.
        3) Install 2.5 inches (64 mm) and above, three-way globe valves, as manufactured for mixing or diverting service to the coil.

2.10 ENCLOSURES

A. BAS Control equipment shall be provided and installed where shown on the associated HVAC Drawings and where needed for complete installation of BAS components. Coordinate mounting locations with other trades.

B. Controllers, power supplies and relays shall be mounted in enclosures. These items may also be mounted within the HVAC equipment control section if permitted by the HVAC equipment manufacturer, and if adequate space is provided.

C. Enclosures shall be designed for control and instrumentation applications, able to be mounted directly on the wall, and capable of adequately protecting the enclosed product in the environment in which it is mounted.

D. Enclosures shall not be mounted directly on HVAC equipment such as air handling unit housings. Enclosures shall be pedestal base or wall mounted.

E. Enclosures: NEMA 1 or as required by location and local code requirements when located in a clean, dry, indoor environment. Indoor enclosures: NEMA 12 or as required by location and local code requirements when installed in other than a clean environment. Outdoor Enclosures and Enclosures in Wet Ambient Conditions: Weatherproof.

F. Control Enclosures: Hinged doors, key lock latch; single key

G. Laminated plastic nameplates, 0.125 inches (3 mm) thick, for enclosures in any mechanical room or electrical room. Place location and unit served on easy to read nameplate.

2.11 OTHER CONTROL SYSTEM HARDWARE

A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes, and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches water gauge static pressure. Honeywell is the basis of design.

B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Actuators shall be heavy-duty electronic communicating type for positioning automatic dampers in response to a communicating signal from the DDC Controller to which they’re connected. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation and actuator analytics shall utilize a two wire, polarity insensitive bus that provides direct communications between a communicating Actuator device and its associated DDC Controller (NPICU, PICU, AUC or AVC). All actuators shall be UL listed. Honeywell is the basis of design.
   1. The Actuator shall accept the following communicated commands:
      a. Actuator Position Command.
      b. Actuator Travel Time.
   2. The Actuator shall provide the following feedback to the Controller:
      a. Actual Position.
      b. Cycle Count.
      c. Status.
      d. Overridden.
   3. The actuator microprocessor control shall provide redundant position feedback methods, feedback potentiometer and counting motor commutations, for accurate position tracking.
   4. The actuator minimum design life shall be: 60,000 full stroke cycles, 60,000 spring-return cycles, and 1,500,000 repositions at rated torque and temperature.
      a. The actuator shall be manufactured under ISO 9001 International Quality Control Standards and be warranted for five years.
   5. The DDC Controller (NPICU, PICU, AUC or AVC) shall provide analytics to provide system alerts at the GUI for the following:
      a. Specific Actuator has reached approximately 90 % of life and must be replaced or it will fail soon.
      b. Specific Actuator position fault has been detected and should be checked.

C. Control Valves: Control valves shall be 2-way pattern or 3-way pattern as shown and constructed for tight shutoff at the pump shut-off head or steam relief valve pressure. Control valves shall operate satisfactorily against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (unless otherwise noted or scheduled on the drawings). Valves with sizes up to and including 2 inches (51 mm) shall be "screwed" configuration and 2-1/2 inches

(63.5 mm) and larger valves shall be "flanged" configuration. All control valves, including terminal unit valves, less than 2 inches (51 mm) shall be ball valves. Electrically actuated control valves shall include spring return type actuators sized for tight shut-off against system pressures (as specified above) and, when specified, shall be furnished with integral switches for indication of valve position (open-closed). Pneumatic actuators for valves, when utilized, shall be sized for tight shut-off against system pressures (as specified above). Honeywell is the basis of design.

D. Control Valve Actuators: Actuators for VAV terminal unit heating coils shall be "drive-open; drive-closed" type. All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or two-position as required for the correct operating sequence. Actuators on valves needing ' fail-safe' operation shall have spring return to Normal position. All applications requiring proportional operation and actuator analytics shall utilize a two wire, polarity insensitive bus that provides direct communications between a communicating Actuator device and its associated DDC Controller (NPICU, PICU, AUC or AVC). All valve actuators shall be UL listed. Honeywell is the basis of design.
   1. The Actuator shall accept the following communicated commands:
      a. Actuator Position Command.
      b. Actuator Travel Time.
   2. The Actuator shall provide the following feedback to the Controller:
      a. Actual Position.
      b. Cycle Count.
      c. Status.
      d. Overridden.
   3. The actuator microprocessor control shall provide redundant position feedback methods, feedback potentiometer and counting motor commutations, for accurate position tracking.
   4. The actuator minimum design life shall be: 60,000 full stroke cycles, 60,000 spring-return cycles, and 1,500,000 repositions at rated torque and temperature.
      a. The actuator shall be manufactured under ISO 9001 International Quality Control Standards and be warranted for five years.
   5. The DDC Controller shall provide analytics to provide system alerts at the GUI for the following:
      a. Specific Actuator has reached approximately 90 % of life and must be replaced or it will fail soon.
      b. Specific Actuator position fault has been detected and should be checked

E. All control valves 2-1/2 inches (63.5 mm) or larger shall have position indication. All hot water control valves shall be Normally Open arrangement. Honeywell is the basis of design.

F. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 degrees to 140 degrees F (-38 degrees to 60 degrees C). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees F (.024 degrees C) over the entire range. Honeywell is the basis of design.

G. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of +/- 0.2 degrees C. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 degrees to 160 degrees F (-38 degrees to 71 degrees C) The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees F (.024 degrees C) over the entire range. Honeywell is the basis of design.

H. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2 %) at 0 to 90 % RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 – 20 mA output). Operating range shall be 0 to 100 % RH and 32 degrees to 140 degrees F (0 degrees to 60 degrees C). Sensors shall be selected for wall, duct, or outdoor type installation as appropriate. Honeywell is the basis of design.

I. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5 %) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure. Honeywell is the basis of design.

J. Indoor Air Quality Multi Sensors: Sensors shall be capable of monitoring Temperature, Humidity, CO2, PM1.0, PM2.5, PM10, and TVOC. Output via BACnet® MS/TP or Modbus RTU. Sensors shall be wall mounted type with Air Quality Score, individual parameter description/ units incorporated into display. Air Quality score shall be based on CO2, PM2.5, and TVOC detected. Operating environment shall be 32 degrees to 122 degrees F (0 degrees to 50 degrees C) 0–95 % RH (No condensation). Input voltage shall be 24 VAC/VDC. Honeywell TR50-5D is the basis of design. Specifications by sensed medium are as follows:
   1. Temperature: Measuring range 32-122°F (0-50°C), accuracy ±1.8°F degrees (±1°C).
   2. Humidity: Measuring range 0-100%, accuracy ±3 % RH (20%–80 % RH).
   3. Carbon Dioxide: Measuring range 0-9999ppm, accuracy ±75 PPM @ 400-1000ppm, ±40 PPM @ 1001-2000ppm.

K. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Honeywell is the basis of design.

L. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1 % of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have an integral static pickup tube. Honeywell is the basis of design.

M. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips. Honeywell is the basis of design.

N. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the BMS in a UL-Certified 508A panel shop. A complete set of ' as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

O. Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of +/- 1 % accuracy. Their range shall be -5 degrees to 250 degrees F (-20 degrees to 121 degrees C). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included. Honeywell is the basis of design.

P. Low Air Temperature Sensors: Provide SPST type switch, with 15 degrees to 55 degrees F (-9 degrees to 13 degrees C), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

Q. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be

enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable / disable.

R. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.

S. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC / 24 VAC operation. Honeywell is the basis of design.

T. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

U. Electric Meters: Honeywell is the basis of design. See Section 26 27 13.

V. HMI: Honeywell is the basis of design.
   1. Provide HTML5 IP touchscreen monitors in specified sizes: 4.3”, 7”, 10.1”, 15.6” or 21.5”.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Carefully inspect installed work of other trades. Verify work is complete to where work of this Section may commence.

B. Do not proceed with installation until substrates have been prepared using methods recommended by manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect and Owner’s representative in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
   1. Install in conduit, wiring and cable, and install equipment in first-class manner, using proper tools, equipment, hangers, and supports, and in locations as required for a neat, attractive installations. No material shall be exposed if it is possible to conceal it. Exposed material shall be installed only with consent of the Engineer.
   2. Install the system as recommended by the manufacturer, using only equipment recommended or acceptable to the manufacturer.
   3. Support sensors as recommended by the manufacturer where inside equipment, such as ductwork. Sensors in the space shall be in small, attractive housings designed for that purpose and mounted on electrical junction box.
   4. Use extreme care making connections to other equipment, such as boilers and chillers. Safeties of equipment are not to be by-passed or overridden by the BAS.
   5. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
   6. Install labels to identify control components.
   7. Provide equipment having moving parts and controlled by BAS with warning labels 2 inches (51 mm) in height, and in bright warning colors, stating equipment is remotely started by automatic controls. Post labels clearly in area of moving parts, including but not limited to belts, fans and pumps.

3.03 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches (1219 mm) above floor with minimum 36 inches (914 mm) of clear access space in front of units. Obtain approval on locations from Owner's representative prior to installation.

B. Components including but not limited to instruments, switches, and transmitters; suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.

C. Identify equipment and panels. Provide permanently mounted tags for panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections, and sized to suit pipe diameter without restricting flow.

3.04 INTERLOCKING AND CONTROL WIRING

A. Interlock and control wiring. Install wiring neatly and professionally, per Division 16 and national, state and local electrical codes.

B. Wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Shielded low capacitance wire for communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of control equipment with the Owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

F. Install control wiring in mechanical, electrical, telephone and boiler rooms in raceways. Install other wiring neatly and inconspicuously per local code. If code allows, control wiring above accessible ceiling spaces may be run with plenum-rated cable (without conduit).

3.05 SOFTWARE

A. Load and debug software for BAS. Operate to prove functionality of each system.
   1. Provide database generation.
   2. System displays: Show analog and binary object types within system; logically laid out for easy use by Owner. Provide outside air temperature indication on system displays associated with economizer cycles.
   3. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.
   4. Binary and analog object types (including zones) shall have the capability to be automatically trended.
   5. Analog inputs (High/Low Limits) and selected binary input alarm points to be prioritized and routed (locally or remotely) with alarm message per Owner's requirements.

B. BAS Contractor: Review programs with Engineer in the programming stage. Make sure programmer understands Engineer's intent and that program will carry out that intent.

C. Bound copy of the complete information on the equipment and components.

D. Spare parts list. Identify equipment critical to maintaining integrity of operating system.

3.06 SYSTEM DEMONSTRATION, VALIDATION AND ACCEPTANCE

A. Contractor will satisfactorily demonstrate operating sequence, daily and seasonal mode changes, and associated energy management routines for equipment controlled including:
   1. Hot water systems.
   2. Chilled water systems.
   3. Air handling units.
   4. Exhaust air systems.
   5. VAV terminal units.

6. Miscellaneous Equipment: Including but not limited to the following.
    a. Fan coil units.
    b. Split system units.

B. Contractor to satisfactorily demonstrate proper operation of associated system points as defined in Division 15, including but not limited to:
    1. Analog input sensing device readings; temperature, humidity, pressure, flow, volume and CO2 sensors.
    2. Analog output controls; valves, dampers and speeds; including proper ranging.
    3. Binary input status readings.
    4. Binary output or two position controls; start/stops, open/closed, in/off.
    5. Pulsed inputs; flow meters, electric meters; including proper ranging.

C. Upon Completion of Work:
    1. Demonstrate complete operating system to Owner's representative.
    2. Certificate stating control system has been tested and adjusted for proper operation.

3.07 TRAINING

A. By BAS manufacturer. Utilize manuals, as-built documentation and on-line help utility.

B. Operator Training: Sixteen (16) hours encompassing, but not limited to the following topics.
    1. Sequence of operation review.
    2. Log in, log out.
    3. Password assignment and modification.
    4. Operator privileges assignment and modification.
    5. Selection of displays and reports.
    6. Commanding of points, including disable/enable.
    7. Use of dialog boxes and menus.
    8. Modifying warning limits, alarm limits and start-stop times.
    9. Modification of color graphic displays.
    10. Modification of alarm and status descriptors.
    11. System initialization.
    12. Backup, download and initialization of DDC in controllers.
    13. Request and viewing of trend logs.
    14. Archive and purge of historical data.
    15. System maintenance procedures.

C. Programmer Training: Eight (8) hours encompassing but not limited to the following topics.
    1. Software review of sequence of operation.
    2. Use of programming tool and any additional plug-ins.
    3. Modification of control programs, including Building Controller, Advanced Application and Application Specific programs.
    4. Add, modify and delete data points.
    5. Use of diagnostics.
    6. System maintenance procedures.
    7. Review of initialization.
    8. Upload/download and off-line archiving of system software.
    9. Creating and modifying color graphics
    10. Operator training performed on site/off site. Coordinate dates/times with Owner.
    11. Tuition for at least one individual to attend a one-week factory training class. If applicable, costs for travel, lodging and meals will be responsibility of Owner.
    12. Printed training material provided by Contractor to training event attendees.

3.08 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.09 CLEANING AND PROTECTION

A. Clean and protect products in accordance with the manufacturer's recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, above grade.

C. Chilled water piping, buried.

D. Chilled water piping, above grade.

E. Equipment drains and overflows.

F. Pipe hangers and supports.

G. Unions, flanges, mechanical couplings, and dielectric connections.

1.02 RELATED REQUIREMENTS

A. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.

E. ASME B31.9 - Building Services Piping; 2025.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.

H. ASTM B32 - Standard Specification for Solder Metal; 2020.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

K. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

L. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2025a.

M. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.

N. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2024.

O. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).

P. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

Q. ASTM F3226/F3226M - Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems; 2019 (Reaffirmed 2024).

R. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

S. AWS D10.12M/D10.12 - Guide for Welding Mild Steel Pipe; 2000.

T. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

U. IAPMO (UMC) - 2024 Uniform Mechanical Code; 2024.

V. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.

W. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

X. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints are not permitted in any location.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:
   1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch (20 mm) gate valves with cap; pipe to nearest floor drain.
   2. Isolate equipment using butterfly valves with lug end flanges.
   3. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
   4. In heating water or chilled water systems, butterfly valves may be used interchangeably with gate and globe valves.
   5. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

2.02 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
   1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D10.12M/D10.12 welded.
   2. Threaded Joints: ASME B16.3, malleable iron fittings.
   3. Mechanical Press Sealed Fittings: ASTM F3226/F3226M, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (Type B), drawn temper, using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
      b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
   2. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

2.03 CHILLED WATER PIPING, BURIED

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.
   2. Joints: Welded in accordance with AWS D10.12M/D10.12.
   3. Casing: Closed glass cell insulation.

2.04 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
   1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D10.12M/D10.12 welded.
   2. Threaded Joints: ASME B16.3, malleable iron fittings.
   3. Mechanical Press Sealed Fittings: ASTM F3226/F3226M, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (Type B), drawn temper.
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
      b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
   2. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

2.05 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.06 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Greater: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

2.07 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches (50 mm, DN) and Less:

1. Ferrous Piping: 150 psi (1034 kPa) brass or malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches (50 mm, DN) and Greater:

C. Dielectric Connections:
1. Waterways:
a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
b. Dry insulation barrier able to withstand 600-volt breakdown test.
c. Construct of galvanized steel with threaded end connections to match connecting piping.
d. Suitable for the required operating pressures and temperatures.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interference with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls, and floors.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

H. Slope piping and arrange to drain at low points.

I. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Install hangers to provide minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
4. Use hangers with 1-1/2 inches (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

J. Use eccentric reducers to maintain top of pipe level.

K. Install valves with stems upright or horizontal, not inverted.

END OF SECTION

SECTION 232114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Suction diffusers.

F. Pressure-temperature test plugs.

G. Balancing valves.

H. Automatic flow control valves.

I. Relief valves.

J. Pressure reducing valves.

1.02 RELATED REQUIREMENTS

A. Section 221119 - Domestic Water Piping Specialties: Backflow preventers.

B. Section 232113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

A. Manufacturers:
   1. American Wheatley, a company of Global Flow Products, LLC: www.wheatleyhvac.com/#sle.
   2. Amtrol Inc: www.amtrol.com/#sle.
   3. Armstrong.
   4. Taco, Inc: www.taco-hvac.com/#sle.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, adjustable flexible EPDM diaphragm or bladder seal factory precharged to 12 psi (80 kPa), and steel support stand.

C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced-pressure-principle backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.
   1. See Section 221119 for backflow preventer specifications.

2.02 AIR VENTS

A. Manual Air Vent: Short vertical sections of 2-inch (50 mm, DN) diameter pipe to form air chamber, with 1/8 inch (6 mm, DN) brass needle valve at top of chamber.

B. Maximum Fluid Pressure: 150 psi (1,034 kPa).

C. Maximum Fluid Temperature: 250 degrees F (121.1 degrees C).

2.03 AIR/DIRT SEPARATORS

A. Coalescing Air/Dirt Separators:
   1. Manufacturers:
      a. Spirotherm, Inc: www.spirotherm.com/#sle.
   2. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1 for maximum fluid service subject to application requirements and manufacturer's standard maximum operating conditions.
   3. Coalescing Medium: Provide structured copper or stainless steel medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
   4. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi (1,034 kPa), threaded to top of separator.
   5. End Connections: Class 150 flanged for 2-1/2 inch (65 mm, DN) and larger otherwise threaded.
   6. Blowdown Connection: Threaded.
   7. Size: Match system flow capacity.
   8. Maximum Fluid Service Pressure: 150 psi (1,034 kPa).
   9. Maximum Fluid Service Temperature: 250 degrees F (121.1 degrees C).

2.04 STRAINERS

A. Size 2 inch (50 mm, DN) and Under:
   1. Provide threaded or sweat brass or iron body for up to 175 psi (1,200 kPa) working pressure, Y-pattern strainer with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Body Material by Fluid Service:
      a. Cast Iron or Brass:
         1) Liquids: Up to 400 psi at 150 degrees F (2,758 kPa at 65.6 degrees C).

B. Size 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN):
   1. Provide flanged iron body for up to 175 psi (1,200 kPa) working pressure, up to 250 degrees F (121.1 degrees C) working temperature, Y-pattern strainer with 1/16 inch (1.6 mm) or 3/64 inch (1.2 mm) stainless steel perforated screen.
   2. Body Material by Fluid Service:
      a. Cast Iron:
         1) Liquids: Up to 200 psi at 150 degrees F (1,379 kPa at 65.6 degrees C).

C. Size 5 inch (125 mm, DN) and Larger:
   1. Provide flanged iron body for up to 175 psi (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.
   2. Liquid Fluid Service: Up to 285 psi at 100 degrees F (1,965 kPa at 37.8 degrees C).

2.05 SUCTION DIFFUSERS

A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch (50 mm) and smaller, flanged for 2-1/2 inch (65 mm, DN) and larger, rated for 175 psi (1200 kPa) working pressure, with inlet

vanes, cylinder strainer with 3/16 inch (5 mm) diameter openings, disposable 5/32 inch (4 mm) mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.

B. Class 125:
   1. Horizontally or vertically mounted angle-pattern fitting with integral-cast vanes, fine particle mesh screen and magnetic drain plugs for particle removal without disassembly.
   2. Maximum Operating Service: 175 psi (1,200 kPa) and 300 degrees F (148.9 degrees C).
   3. Sizes, Material, and Connection:
      a. 2 inch (50 mm, DN) and Smaller: Cast iron body, threaded.
      b. 2-1/2 to 12 inch (65 to 300 mm, DN): Ductile iron body, flanged.

2.06 PUMP CONNECTORS

A. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Operating Service: 150 psi (1030 kPa) at 120 degrees F (49 degrees C).
   2. Accommodate the Following:
      a. Angular Rotation: 15 degrees.
      b. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Same as specified for pipe jointing.
   4. Provide necessary accessories including, but not limited to, swivel joints.

2.07 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F (93 degrees C).

B. Application: Use extended length plugs to clear insulated piping.

2.08 BALANCING VALVES

A. Size 2 inch (50 mm, DN) and Smaller:
   1. Provide ball or globe style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and female sweat, NPT threaded, press, or soldered connections.
   2. Metal construction materials consist of bronze or brass.
   3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.
   4. Maximum Service Operation: 300 psi at 250 degrees F (2,068 kPa at 121.1 degrees C).

B. Size 2-1/2 inch (65 mm, DN) and Larger:
   1. Provide ball, globe, or butterfly style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and flanged or grooved connections.
   2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
   3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.
   4. Maximum Service Operation: 175 psi at 250 degrees F (1,200 kPa at 121.1 degrees C).

2.09 AUTOMATIC FLOW CONTROL VALVES

A. Construction:
   1. Brass, bronze, or iron body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.
   2. Built-in lug-type outlet butterfly valve with 2-position handle.

B. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

C. Control Mechanism: Provide stainless steel or nickel-plated, brass piston or regulator cup, operating against stainless steel helical or wave formed spring or elastomeric diaphragm and polyphenylsulfone orifice plate.

D. Size: Match system flow capacity.

2.10 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.11 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 232113.

B. Materials of Construction:
   1. Valve Body: Constructed of bronze, cast iron, brass, iron, or _____.
   2. Internal Components: Construct of stainless steel, brass, or _____ and engineered plastics, composition material, or _____.

C. Connections:
   1. NPT threaded: 1/2 inch (15 mm, DN) or 3/4inch (20 mm, DN).
   2. Soldered: 1/2 inch (15 mm, DN).

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 400 psi (2,758 kPa).

F. Maximum Fluid Temperature: 180 degrees F (82 degrees C).

G. Adjustable Pressure Range: From 10 to 45 psi (69 to 310.3 kPa), set to 25 psi (172 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties and equipment in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

D. Provide valved drain and hose connection on strainer blowdown connection.

E. Support pump fittings with floor-mounted pipe and flange supports.

F. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

G. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

H. Pipe relief valve outlet to nearest floor drain.

I. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

3.02 MAINTENANCE

A. See Section 017000 - Execution Requirements for additional requirements relating to maintenance service.

B. Provide service and maintenance of glycol system for one year from date of Substantial Completion at no extra charge to Owner.

C. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.

D. Explain corrective actions to Owner's maintenance personnel in person.

END OF SECTION

SECTION 232123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. In-line pump systems.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230513 - Common Motor Requirements for HVAC Equipment.

C. Section 230934 - Variable-Frequency Motor Controllers for HVAC.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Fluid Technology, Inc: www.armstrongfluidtechnology.com/#sle.

B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com/#sle.

C. Grundfos Pumps Corporation: www.grundfos.com/#sle.

D. Taco.

2.02 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Electrical Requirements:
   1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
   2. Variable Frequency Drives (VFDs): Provide in accordance with Section 230934, except for integral-VFDs.
   3. Enclosures: Provide unspecified product(s) required to fit motor:

2.03 IN-LINE PUMP SYSTEMS

A. In-line Pump System: Two variable speed, close-coupled, vertical pumps manifold with radially-split casing and integral controls rated for discharge pressures up to 220 psi (1516 kPa).

B. Casing: Cast iron, with suction and discharge gauge port, casing wear ring, seal flush connection, drain plug, flanged suction, and discharge.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous duty temperature.

F. Electrical:
   1. Motor: See schediles for electrical requiremwents unless specified otherwise; see Section 230513.
   2. Wiring Terminations: Single point connection, provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
   3. Integral Controls:
      a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.
      b. DDC Controller: VFD-integrated or external controller module with visual-tactile interface and minimum of 2 analog inputs, 2 digital inputs, and real-time clock.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Provide drains for bases and seals, piped to and discharging into floor drains.

D. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. See Section 033000.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Pressure relief valves.

G. Filter-driers.

H. Solenoid valves.

1.02 RELATED REQUIREMENTS

A. Section 230716 - HVAC Equipment Insulation.

1.03 REFERENCE STANDARDS

A. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.

C. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

H. ASME B31.9 - Building Services Piping; 2025.

I. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

J. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.

D. Valves:
   1. Use service valves on suction and discharge of compressors.

E. Strainers:
   1. Use line size strainer upstream of each automatic valve.

F. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
   5. Vertical Support: Steel riser clamp.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

B. Refrigerant: R-454B as defined in ASHRAE Std 34.

2.05 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.06 VALVES

A. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi (3450 kPa).

2.07 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi (2960 kPa).

2.08 PRESSURE RELIEF VALVES

A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi (1620 kPa).

2.09 FILTER-DRIERS

A. Performance:
   1. Flow Capacity - Liquid Line: _____ ton (_____ kW), minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
   2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
   3. Design Working Pressure: 350 psi (2410 kPa), minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.10 SOLENOID VALVES

A. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi (3450 kPa).

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Provide clearance for installation of insulation and access to valves and fittings.

F. Insulate piping.

G. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

END OF SECTION

SECTION 232500
HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials.
   1. System cleaner.
   2. Closed system treatment (water).

B. By-pass (pot) feeder.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: Owner furnished treatment equipment.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable codes for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Perform work in accordance with local health department regulations.

2.02 MATERIALS

A. System Cleaner:
   1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.

B. Closed System Treatment (Water):
   1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
   2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
   3. Conductivity enhancers; phosphates or phosphonates.

2.03 BY-PASS (POT) FEEDER

A. 1.8 gal (6.8 L) quick opening cap for working pressure of 175 psi (1200 kPa).

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
   1. As recommended by manufacturer.

B. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising temperature to 160 degrees F (71 degrees C) and maintain for 12 hours minimum.

2. Remove heat and circulate to 100 degrees F (37.8 degrees C) or less; drain systems as quickly as possible and refill with clean water.
3. Circulate for 6 hours at design temperatures, then drain.
4. Refill with clean water and repeat until system cleaner is removed.

C. Chilled Water Systems:
1. Circulate for 48 hours, then drain systems as quickly as possible.
2. Refill with clean water, circulate for 24 hours, then drain.
3. Refill with clean water and repeat until system cleaner is removed.

D. Remove, clean, and replace strainer screens.

E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide 3/4 inch (19 mm) water coupon rack around circulating pumps with space for 4 test specimens.

3.05 MAINTENANCE

A. Provide a separate maintenance contract for specified maintenance service.

B. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

C. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

D. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

E. Provide laboratory and technical assistance services during this maintenance period.

F. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Air plenums and casings.

D. Ducts for kitchen exhaust applications.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

D. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

I. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

L. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

M. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for duct materials.

1.04 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated.

C. Duct Shape and Material in accordance with schedule on drawings.

D. Duct Sealing and Leakage in accordance with schedule on drawings.

E. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
   7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Rectangular Metal Duct:
   1. Rectangular Double Wall Insulated: Rectangular, longitudinal lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
      a. Insulation:
         1) Thickness: 1 inch (25 mm).
         2) Material: Fiberglass.

C. Flat-Oval Metal Ducts:
   1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
      a. Fittings: Manufacture at least two gauges heavier metal than the duct.
      b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
   2. Flat-Oval Double Wall Insulated Duct: Machine made from round spiral lock seam duct.
      a. Fittings: Manufacture with solid inner wall.
      b. Inner Wall: Perforated galvanized steel.
      c. Insulation:
         1) Thickness: 1 inch (25 mm) fiberglass.

D. Round Metal Ducts:
   1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
   2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
      a. Insulation:
         1) Thickness: 1 inch (25 mm).
         2) Material: Fiberglass.
   3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

E. Round Spiral Duct:

1. Round spiral lock seam duct with galvanized steel outer wall.

F. Connectors, Fittings, Sealants, and Miscellaneous:
   1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
   2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
      a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
      b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
   1. Pressure Rating: Refer to schedule on drawings.
   2. Maximum Velocity: 5500 fpm (27.9 m/sec).
   3. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

B. Medium Pressure Flexible Ducts: UL 181, Class 1, aluminized laminate, mechanically fastened and rolled using galvanized steel to form spiral helix.
   1. Inner Core: Tri-laminate of polyester, fiberglass, and aluminum foil.
   2. Pressure Rating: 15 in-wc (3.74 kPa) positive and 5 in-wc (1.25 kPa) negative.
   3. Maximum Velocity: 5500 fpm (27.9 m/sec).
   4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

2.04 AIR PLENUMS AND CASINGS

A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.

B. Minimum Fabrication Requirements:
   1. Fabricate acoustic plenum or casing with reinforcing turned inward.
   2. Provide 16-gauge, 0.059-inch (1.52 mm) sheet steel back facing and 22-gauge, 0.029-inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers.
   3. Construct panels 3 inches (75 mm) thick, packed with 4.5 pcf (72 kg/cu m) minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch (1.52 mm) sheet steel.
   4. Mount floor-mounted plenum or casings on 4-inch (100 mm) high concrete curbs. At floor, rivet panels on 8-inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18-gauge, 0.052-inch (1.31 mm) expanded metal mesh supported at 12-inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.

C. Access Doors:
   1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
   2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
   3. Provide clear wire glass observation ports, minimum 6 by 6 inch (150 by 150 mm) size.

2.05 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances in accordance with NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm (7.6 to 12.7 m/s).

C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E. Kitchen Hood and Grease Exhaust Duct:
   1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
   2. Zero Clearance, 2-Hour Fire-Rated, Round, Double-Wall, Premanufactured Grease Duct:
      a. UL Listed and labeled to UL 1978 and UL 2221.
      b. Nominal 3 inches (76.2 mm) thick, high density body soluble fiber insulation between 20-gauge, 0.035-inch (0.95 mm) Type 304 stainless steel liner, and 24-gauge, 0.0239-inch (0.61 mm) aluminized steel sheet outer jacket.
      c. Seal joints during installation with factory-supplied overlapping V-bands and sealant.
      d. Through-penetration firestop listed to UL 1479 or ASTM E814.
      e. Minimum horizontal slope of 1/16 inch per foot (0.52 cm per m) per manufacturers listing to UL 1978.
   3. Grease Exhaust Duct Access Doors:
      a. Listed when tested in accordance with UL 1978.
      b. Install hinged access doors where indicated or required for access for cleaning and inspection of duct.
      c. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Flexible Ducts: Connect to metal ducts with adhesive.

G. Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

H. Duct sizes indicated are precise inside dimensions.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.

K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Flexible duct connectors.

F. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

E. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

D. Operators: UL listed and labeled; spring-return, pneumatic-type suitable for operation on 0-20 psig (0-140 kPa) instrument air. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

2.04 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.05 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

C. Maximum Installed Length: 14 inch (356 mm).

2.06 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

C. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches (200 by 1825 mm). Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
   1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.

D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

D. Install combination smoke and fire dampers in accordance with NFPA 92.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Ceiling exhaust fans.

C. Kitchen hood upblast roof exhausters.

1.02 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2025.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

H. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.02 ROOF EXHAUSTERS

A. Manufacturers:
   1. Greenheck Fan Corporation.
   2. Loren Cook.
   3. Twin City Fan & Blower.

B. Fan Unit: Direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: 8 inch (200 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and wall mounted solid-state speed controller (or motor mounted).

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

F. Performance Ratings: As indicated on drawings.

2.03 CEILING EXHAUST FANS

A. Manufacturers:
   1. Greenheck Fan Corporation: www.greenheck.com/#sle.
   2. Loren Cook.
   3. Twin City Fan & Blower: www.tcf.com/#sle.

B. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.

C. Grille: Molded white plastic.

D. Performance Ratings: As indicated on drawings.

2.04 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

A. Manufacturers:
   1. Captive Aire.

B. Direct Drive Fan:
   1. Fan Wheel:
      a. Type: Non-overloading, backward inclined centrifugal.
      b. Material: Aluminum, statically and dynamically balanced.
   2. Housing:
      a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
      b. Rigid internal support structure.
      c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
      d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
      e. Provide breather tube for fresh air motor cooling and wiring.

C. Shafts and Bearings:
   1. Fan Shaft:
      a. Ground and polished steel with anti-corrosive coating.
      b. First critical speed at least 25 percent over maximum cataloged operating speed.
   2. Bearings:
      a. Permanently sealed or pillow block type.
      b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
      c. 100 percent factory tested.

D. Drive Assembly:
   1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
   2. Belts: Static free and oil resistant.
   3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
   4. Motor pulley adjustable for final system balancing.
   5. Readily accessible for maintenance.

E. Roof Curb: 8 inch (200 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, ventilated double wall, and factory installed nailer strip.

F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Install backdraft dampers on inlet to roof and wall exhausters.

E. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 233600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Variable-volume units.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 233100 - HVAC Ducts and Casings.

C. Section 251400 - Integrated Automation Local Control Units: HVAC controllers.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.

E. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).

F. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

A. Manufacturers:
   1. Metalaire, a brand of Metal Industries Inc: www.metalaire.com/#sle.
   2. Price Industries: www.priceindustries.com/#sle.
   3. Trane Technologies, PLC: www.trane.com/#sle.
   4. Tuttle and Bailey: www.tuttleandbailey.com/#sle.
   5. Titus..

B. General:

1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:
1. Minimum 22 gauge, 0.0299 inch (0.76 mm) galvanized steel.
   a. Casing leakage to meet ASHRAE Std 130.
2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
   a. 1 inch (_____ mm) thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.
   b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.

E. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gauge, 0.0299 inch (0.76 mm) galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
3. Coil leak tested to minimum 350 psig (2413 kPa).
4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

F. Controls:
1. DDC (Direct-Digital Controls):
   a. Include a factory-installed, unit-mounted, direct-digital controller.
   b. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
   c. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
      1) Occupied and unoccupied operating mode.
      2) Remote reset of temperature or CFM set points.
      3) Proportional, plus integral control of room temperature.
      4) Monitoring and adjusting with portable terminal.
   d. Room Sensor:
      1) Compatible with temperature controls specified.
      2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
   e. See Section 25 1400.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C. See drawings for the size(s) and duct location(s) of the air terminal units.

D. Provide ceiling access doors or locate units above easily removable ceiling components.

E. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

F. Do not support from ductwork.

G. Connect to ductwork in accordance with Section 233100.

3.02 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

END OF SECTION

SECTION 235216
CONDENSING BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230913 - Instrumentation and Control Devices for HVAC.

C. Section 232114 - Hydronic Specialties.

D. Section 232123 - Hydronic Pumps.

E. Section 232500 - HVAC Water Treatment.

F. Section 235100 - Breechings, Chimneys, and Stacks.

1.03 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2022.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

E. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2025, with Errata.

F. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); Current Edition.

G. NFPA 54 - National Fuel Gas Code; 2024.

H. SCAQMD 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; 1990, with Amendment (2018).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

C. Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide a five year warranty to include coverage for heat exchanger.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Natural Gas Condensing Boiler Indoor Applications:
   1. Aerco.
   2. Lochinvar LLC: www.lochinvar.com/#sle.
   3. The Fulton Companies: www.fulton.com/#sle.

2.02 MANUFACTURED UNITS

A. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

B. Unit: Metal membrane wall, water or fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, boiler trim, insulation, and removable jacket, suitable for indoor application.

2.03 BOILER CONSTRUCTION

A. Comply with the minimum requirements of ASME BPVC-IV and ANSI Z21.13 for construction of boilers.

B. Assembly to bear the ASME "H" stamp and comply with the efficiency requirements of the latest edition of ASHRAE Std 90.1 I-P.

C. Required Directory Listings:
   1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.
   2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); current edition at www.nationalboard.org.

D. Heat Exchanger: Construct with materials that are impervious to corrosion where subject to contact with corrosive condensables.

E. Provide adequate tappings, observation ports, removable panels, and access doors for entry, cleaning, and inspection.

F. Insulate casing with insulation material, protected and covered by heavy-gauge metal jacket.

G. Factory apply boiler base and other components, that are subject to corrosion, with durable, acrylic, powder coated, painted, or weather-proofed finish.

2.04 BOILER TRIM

A. ASME rated pressure relief valve.

B. Flow switch.

C. Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

D. Temperature and pressure gauge.

E. Pressure Switches:
   1. High gas pressure.
   2. Low gas pressure.
   3. Air pressure.

F. Manual reset high limit.

G. Boiler Pump (where required by boiler design):
   1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
   2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.
   3. Pump time delay.

2.05 FUEL BURNING SYSTEM

A. Provide forced draft automatic burner or pulse combustion, integral to boiler, designed to burn natural gas, and maintain fuel-air ratios automatically.
   1. Blower Design: Statically and dynamically balanced to supply combustion air; direct connected to motor.
   2. Forced Draft Design: Mixes combustion air and gas to achieve 90 percent combustion efficiency.
   3. Pulse Combustion Design: Self-aspirating, not requiring blower for combustion.
   4. Combustion Air Filter: Protects fuel burning system from debris.

B. Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.

C. Emission of Oxides of Nitrogen Requirements: Comply with SCAQMD 1146.1 for natural gas fired system, as applicable.

D. Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe.

2.06 FACTORY INSTALLED CONTROLS

A. Option for internal or external (0-10) VDC control.

B. Temperature Controls:
   1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature.
   2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
   3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls.

E. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
   1. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Install boiler on concrete housekeeping base, sized minimum of 4 inches (100 mm) larger than boiler base in accordance with Section 033000.

D. Coordinate factory installed controls with Section 230913.

E. Coordinate provisions for water treatment in accordance with Section 232500.

F. Pipe relief valves to nearest floor drain.

G. Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack with suitable piping material to neutralizer prior to discharging into nearest floor drain.

H. Install primary boiler pump in accordance with Section 232123.

I. Provide piping connection and accessories in accordance with Section 232114.

J. Connect vent combustion generated fumes to breeching, chimney or exhaust stack.

3.02 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.

END OF SECTION

SECTION 236430
AIR COOLED CHILLER

GENERAL

1.01 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

B. AWWA C606 - Grooved and Shouldered Joints; 2022.

C. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 GENERAL REQUIREMENTS

A. The requirements of this Section shall conform to the general provisions of the Contract, including General and Supplementary Conditions, Conditions of the Contract, and Contract Drawings.

1.03 SCOPE

A. Provide Microprocessor controlled, multiple scroll compressor, air-cooled, liquid chillers of the scheduled capacities as shown and indicated on the Drawings, including but not limited to:
   1. Chiller package
   2. Charge of refrigerant and oil
   3. Electrical power and control connections
   4. Chilled liquid connections
   5. Manufacturer start-up

1.04 QUALITY ASSURANCE

A. Products shall be Designed, Tested, Rated and Certified in accordance with, and Installed in compliance with applicable sections of the following Standards and Codes:
   1. AHRI 550/590 – Water Chilling Packages Using the Vapor Compression Cycle
   2. AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
   3. ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration
   4. ANSI/ASHRAE 34 – Number Designation and Safety Classification of Refrigerants
   5. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
   6. ANSI/NFPA 70 – National Electrical Code (N.E.C.)
   7. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1
   8. OSHA – Occupational Safety and Health Act
   9. Manufactured in facility registered to ISO 9001
   10. Conform to Intertek Testing Services for construction of chillers and provide ETL/cETL Listed Mark

B. Factory Run Test: Chiller shall be pressure-tested, evacuated and fully charged with refrigerant and oil, and shall be factory operational run tested with water flowing through the vessel.

C. Chiller manufacturer shall have a factory trained and supported service organization.

D. Warranty: Manufacturer shall Warrant all equipment and material of its manufacture against defects in workmanship and material for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever occurs first.

1.05 DELIVERY AND HANDLING

A. Unit shall be delivered to job site fully assembled with all interconnecting refrigerant piping and internal wiring ready for field installation and charged with refrigerant and oil by the Manufacturer.

B. Provide protective covering over vulnerable components for unit protection during shipment. Fit nozzles and open ends with plastic or fabric enclosures.

C. Unit shall be stored and handled per Manufacturer’s instructions.

PRODUCTS

2.01 CHILLER MATERIALS AND COMPONENTS

A. General: Install and commission, as shown on the schedules and plans, factory assembled, charged, and tested air cooled scroll compressor chiller(s) as specified herin. Chiller shall be designed, selected, and constructed using a refrigerant with Flammability rating of "1", as defined by ANSI/ASHRAE STANDARD 34 Number Designation and Safety Classification of Refrigerants. Chiller shall include not less than two refrigerant circuits above 50 tons (200kW), scroll compressors, direct-expansion type evaporator, air-cooled condenser, refrigerant, lubrication system, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components and special features as specified herin or required for safe, automatic operation.

B. Cabinet: External structural members shall be constructed of heavy guage, galvanized steel coated with baked on powder paint which, when subject to ASTM B117, 1000 hour, 5% salt spray test, yields minimum ASTM 1654 rating of "6".

C. Operating Characteristics: Provide low and high ambient temperature control options as required to ensure unit is capable of operation from 30°F to 115°F (-1°C to 46°C) ambient temperature. [Optional: -10°F to 125°F (-23°C to 52°C) ambient.]

D. Service Isolation valves: Discharge (ball type) isolation valves factory installed per refrigerant circuit. Includes a system high-pressure relief valve in compliance with ASHRAE15.

E. Pressure Transducers and Readeout Capability
   1. Discharge Pressure Transducers: Permits unit to sense and display discharge pressure.
   2. Suction Pressure Transducers: Permits unit to sense and display suction pressure.
   3. High Ambient Control: Allows units to operate when the ambient temperature is above 115°F (46°C). Includes discharge pressure transducers

2.02 COMPRESSORS

A. Compressors: Shall be hermetic, scroll-type, including:
   1. Compliant design for axial and radial sealing.
   2. Refrigerant flow through the compressor with 100% suction cooled motor.
   3. Large suction side free volume and oil sump to provide liquid handling capability.
   4. Compressor crankcase heaters to provide extra liquid migration protection.
   5. Annular discharge check valve and reverse vent assembly to provide low-pressure drop, silent shutdown and reverse rotation protection.
   6. Initial oil charge.
   7. Oil level sight glass.
   8. Vibration isolator mouonts for compressors.
   9. Brazed-type connections for fully hermetic refrigerant circuits.
   10. Compressor Motor overloads capable of monitoring compressor motor current. Provides extra protection against compressor reverse rotation, phase-loss and phase-imbalance.

2.03 REFRIGERANT CIRCUIT COMPONENTS

A. Each refrigerant circuit shall include: a discharge service ball type isolation valve, high side pressure relief, liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, and flexible, closed-cell foam insulated suction line and suction pressure transducer.

2.04 HEAT EXCHANGERS

A. Evaporator:
   1. Evaporator shall be brazed-plate stainless steel construction capable of refrigerant working pressure of 650 psig (3103 kPa) and liquid side pressure of 150 psig (1034 kPa) [Option for 300 psig (2068 kPa) available].
   2. Brazed plate heat exchangers shall be UL listed.

3. Exterior surfaces shall be covered with 3/4" (19mm), flexible, closed cell insulation, thermal conductivity of 0.26k ([BTU/HR-Ft² -
   a. °F]/in.) maximum.
4. Water nozzles shall be provided with grooves for field provided ANSI/AWWA C606 mechanical couplings.
5. Evaporator shall include vent and drain fittings and thermostatically controlled heaters to protect to -20°F (-29°C) ambient in off-cycle.
6. A serviceable wye-strainer and mechanical couplings shall be provided for field installation on evaporator inlet prior to startup.
7. Evaporator shall be provided with piping extension kit and mechanical couplings to extend liquid connection from evaporator to edge of unit. Thermal dispersion type flow switch shall be factory installed in the evaporator outlet pipe extension and wired to the unit control panel. Insulation and heat trace on piping shall be responsibility of installing contractor. Extension kit nozzle connections shall be ANSI/AWWA C606 (grooved).

B. Air-cooled Condenser:
1. Coils: Condenser coils shall be constructed of a single material to avoid galvanic corrosion due to dissimilar metals. Coils and headers are brazed as one piece. Integral sub cooling is included. Coils shall be designed for a design working pressure of 650 PSIG (45 bar). Condenser coil shall be washable with potable water under 100 psi (7 bar) pressure.
2. Low Sound Fans: Shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a low noise, full-airfoil cross section, providing vertical air discharge and low sound. Each fan shall be provided in an individual compartment to prevent crossflow during fan cycling. Guards of heavy gauge, PVC (poly- vinylchloride) coated or galvanized steel shall be factory installed.
3. Fan Motors: High efficiency, direct drive, 6 pole, 3 phase, insulation class “F”, current protected, Totally Enclosed Air-Over (TEAO) , rigid mounted, with double sealed, permanently lubricated, ball bearings.
4. Low Sound Fans with Variable Speed Drives. All fans shall be powered by VSDs. Fans shall provide vertical air discharge from extended orifices. Fans shall be composed of corrosion resistant aluminum hub and glass-fiber-reinforced polypropylene composite blades molded into a low-noise airfoil section. Fan impeller shall be dynamically balanced for vibration-free operation. Fan guards of heavy gauge, PVC (polyvinyl chloride) coated or galvanized steel.

2.05 CONTROLS

A. General: Automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transients.

B. Power/Control Enclosure: Rain and dust tight NEMA 3R powder painted steel cabinet with hinged, latched, and gasket sealed door.

C. Microprocessor Control Center:
1. Automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pumpdown at system shutdown, condenser fans, evaporator pump, evaporator heater, unit alarm contacts, and chiller operation from -10°F to 125°F (- 23°C to 52°C) ambient. Automatic reset to normal chiller operation after power failure.
2. Software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed real-time-clock (RTC) memory for minimum 5 years.
3. Forty character liquid crystal display, descriptions in English (or Spanish, French, Italian, or German), numeric data in English (or Metric) units. Sealed keypad with sections for Setpoints, Display/Print, Entry, Unit Options & clock, and On/Off Switch.
4. Programmable Setpoints (within Manufacturer limits): display language; chilled liquid temperature setpoint and range, remote reset temperature range, daily schedule/holiday for start/stop, manual override for servicing, low and high ambient cutouts, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-

recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).

5. Display Data: Return and leaving liquid temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, English or metric data, suction pressure cutout setting, each system suction pressure, liquid temperature reset via a 4-20milliamp or 0-10 VDC input, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.
6. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. System Safeties include: high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.
7. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation.
8. Alarm Contacts: Low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.
9. BAS Communications: YORKTalk 2, BACnet MS/TP, Modbus and N2 communication capabilities are standard.

D. Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

2.06 POWER CONNECTION AND DISTRIBUTION

A. Power Panels:
1. NEMA 3R/12 rain/dust tight, powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection(s), control power connections, compressor and fan motor start contactors, current overloads, and factory wiring.
2. Power supply shall enter unit at a single location, be 3 phase of scheduled voltage, and connect to individual terminal blocks per compressor. Separate disconnecting means and/or external branch circuit protection (by Contractor) required per applicable local or national codes.

B. Compressor, control and fan motor power wiring shall be located in an enclosed panel or routed through liquid tight conduit.

2.07 ACCESSORIES AND OPTIONS

A. Some accessories and options supersede standard product features. Your Johnson Controls representative will be pleased to provide assistance.

B. Microprocessor controlled, Factory installed Across-the-Line type compressor motor starters as standard.
1. High Ambient Control: Permits unit operation above 115°F ambient.

C. Power Supply Connections:
1. Single Point or Multiple Point Disconnect: Single or Dual point Non-Fused Disconnect(s) and lockable external handle (in compliance with Article 440-14 of N.E.C.) can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied, by others, in the incoming power wiring, which must comply with the National Electric Code and/or local codes.

D. Control Power Transformer: Converts unit power voltage to 120-1-60 (500 VA capacity). Factory-mounting includes primary and secondary wiring between the transformer and the control panel.

E. Protective Chiller Panels (Factory or Field Mounted)
   1. Louvered/Wire Panels: Louvered steel panels on external condenser coils painted as per remainder of unit cabinet. Heavy gauge, welded wire-mesh, coated to resist corrosion, around base of machine to restrict unauthorized access.

F. Thermal Dispersion Flow Switch (Factory installed and wired in piping extension kit): Normally open, 30bar pressure rating, stainless steel 316L construction, IP67, -4°F to 158°F ambient rating.

G. Vibration Isolation (Field installed):
   1. 1” Deflection Spring Isolators: Level adjustable, spring and cage type isolators for mounting under the unit base rails.

EXECUTION

3.01 INSTALLATION

A. General: Rig and Install in full accordance with Manufacturer’s requirements, Project drawings, and Contract documents.

B. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Adjust and level chiller on support structure.

C. Components: Installing Contractor shall provide and install all auxiliary devices and accessories for fully operational chiller.

D. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor.

E. Controls: Coordinate all control requirements and connections with Controls Contractor.
   1. Finish: Installing Contractor shall paint damaged and abraded factory finish with touch-up paint matching factory finish.

END OF SECTION

SECTION 237313
MODULAR INDOOR AIR HANDLING UNIT

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

C. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

D. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.

E. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2008 (Reapproved 2019).

F. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints; 2025.

G. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments; 2024.

H. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

K. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

L. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.02 1 SECTION INCLUDES

A. Indoor air handling units and components as scheduled and shown on drawings.

B. Motor disconnects, motor starters, and variable frequency drives.

1.03 RATINGS AND CERTIFICATIONS

A. Unit will conform to AMCA 210 for fan performance ratings.

B. Unit will conform to E.T.L. standards. Unit will be ETL listed.

C. Unit will conform to AHRI 410 for capacities, pressure drops, and selection procedures of air coils.

D. Unit will conform to ANSI/AHRI 430 for all fabrication procedures of air handling units. Unit will have airflow performance certified to ANSI/AHRI 430.

E. Motors covered by the Federal Energy Policy Act (EPACT) will meet EPACT requirements.

F. Damper performance will comply with AMCA 500.

G. Unit will be ISO 9001 certified.

H. Unit will be manufactured in an ISO 9002 certified facility.

I. Filter media to comply with ANSI/UL 900 listed Class I or Class II.

J. Control Wiring comply with NEC codes & ETL requirements.

K. Unit will comply with energy use AHSRAE 90.1.

1.04 WARRANTY

A. Unit will be covered by a limited parts (18 months (12 months from start-up)) and labor (18 months (12 months from start-up)) warranty from date of shipment . Warranty will cover manufacturer defects. Warranty work will be performed by manufacturer’s factory-trained and factory-employed technician.

B. B. Include factory-provided controls in the parts warranties.

C. Parts associated with routine maintenance, such as belts and air filters will be excluded.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

A. Air Handling Unit (AHU) will consist of a structural base, insulated casing, access doors, fans, motors, motor controls, coils, filters, dampers, controls, components, and accessories; as shown on drawings, schedules, and specifications.

B. Unit will meet the specified levels of performance for scheduled items including airflow, static pressure, cooling capacity, heating capacity, electrical characteristics, sound, casing leakage, panel deflection and casing thermal performance.

C. Unit will maintain structural integrity when wall panels are removed.

D. Internal components and accessories will be as specified and scheduled (unless noted otherwise). Components and accessories will be installed by the AHU manufacturer in an ISO-9002 certified facility.

E. Unit will be shipped in one piece or with shipping spltis necessary for shipping and installation.

F. Manufacturer will provide detailed, step-by-step instructions for disassembly and reassembly.

2.02 BASE RAIL

A. Unit will be provided with a 8” structural base rail under the full perimeter of the unit, formed from mill galvanized steel.

B. Unit will be provided with base rail and lifting lug system that does not require additional support for rigging. Include base rail lifting lugs at unit corners.

2.03 CASING

A. Casing construction will not rely on the casing panels for structural integrity.

B. Casing panels will be 2” double-wall construction with thermal break. Thermal break will be between interior and exterior liner of the panel assembly, and between the panel and casing framework.

C. Provide casing with minimum thermal resistance (R-value) of 16 hr-ft2-°F/BTU. Exposed insulation is not acceptable.

D. Casing panel insulation will be injected polyurethane foam. Foam insulation will be manufactured by EcoMate®. Rigid foam board panels will not be used.

E. All exterior casing panels (roof, wall, floor, access door) will be made of G90 galvanized steel. All interior casing panels (roof, wall, floor, access door) will be made of G90 galvanized steel.

F. Panel assembly will meet UL standard 60336-2-40 for fire safety. Panel insulation will comply with the requirements of NFPA 90A.

G. Insulation system provided will be resistant to mold growth in accordance with a standardized test method such as UL 181 or ASTM C1338.

H. Encapsulate insulation with sheet metal so that air does not contact insulation. Solid lined double-walled panels insulated with injected foam will be hermetically sealed at each corner and around their entire perimeter to eliminate airflow through the panel and to eliminate microbial growth potential within the casing wall.

I. Unit will conform to ASHRAE Standard 111 Class 6 for casing leakage of no more than 1% of design airflow at 1.25 times design static pressure up to a maximum of +8 inches w.g. in positive pressure sections and -8 inches w.g. in negative pressure sections down to a minimum of 50 CFM measurable leakage at or 5,000 design CFM.

J. Unit will be provided with wall panels and access doors that deflect no more than L/240 when subjected to 1.5 times design static pressure up to a maximum of +8 inches w.g. in positive

pressure sections and -8 inches w.g. in negative pressure sections. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

K. Unit will be provided with floors and roofs that deflect no more than L/240 when subjected to a 300 lb static load at mid-span. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

2.04 ACCESS DOORS

A. Unit will be provided with double wall access door(s) that meet requirements for the AHU casing.

B. Unit will be provided with industrial-style stainless steel hinges that permit 180 degrees of door swing.

C. Unit will be provided with latches with roller cam mechanisms that ensure a tight seal. Rotating knife-edge or “paw” latches are not acceptable.

D. Unit will be provided with each door with a single handle linked to multiple latching points or a separate handle for each latching point. Doors serving access segments will have an interior latch handle.

E. Unit will be provided with access doors with a locking hasp to accommodate a lockout device.

2.05 COILS: HEATING AND COOLING

A. ACCEPTABLE MANUFACTURER
   1. Coil will be manufactured by the same manufacturer as the AHU manufacturer, except where noted in contract documents.

B. GENERAL DESCRIPTION
   1. Coil will meet or exceed performance scheduled on drawings.
   2. Coil will be provided with performance certified in accordance with AHRI Standard 410 for coil capacity and pressure drop, wherever applicable. Coils circuits will be designed such that the fluid velocity is within the range of certified rating conditions at design flow.
   3. Cooling coils will be provided with a maximum face velocity as scheduled. Face velocity calculations will be based on the finned area of the coil.
   4. Cooling coil will be provided with drain pan that is sufficient to contain coil condensate. Drain pan will extend a minimum of 6” downstream of the face of the coil.
   5. Coil segment casing will accommodate full-face coils as scheduled.
   6. Access doors will be located to provide clearance for pipe insulation, connectors, and accessories. Space will allow a minimum of 90 degrees of door swing.
   7. Coils will be built in their own G90 galvanized steel full perimeter frame. Tube sheets on each end will have fully drawn collars to support and protect tubes. Horizontal coil casing and support members will allow moisture to drain. Bulkhead support will be G90 galvanized steel and will not block finned area.
   8. Individual coils will be removable from the side of the AHU.
   9. Intermediate drain pan made of 304 stainless steel will be provided on stacked cooling coils or any cooling coil taller than 48 inches finned height. Intermediate drain pan will slope in a minimum of two planes toward a single drain connection. Intermediate drain pan will be provided with downspouts routed to lower drain pan.
   10. A single intermediate vertical coil support will be provided on coils with a finned length greater than 62”. Two vertical supports will be provided on coils with a finned length greater than 100”, and three vertical supports on coils with a finned length greater than 141”. Intermediate vertical coil support will be same material as the casing.
   11. Gap between coil stub out connection and AHU casing, will be insulated with a spool-shaped sleeve grommet. Adhesive rings applied to the casing walls will not be acceptable.
   12. Water coils will be operable at 325 psig working pressure and up to 250 °F. Factory test water coils with 325 psig compressed air under water. Water coils will conform to Subsection 12.3, “Water-Containing Parts,” of UL 207, “Standard for Safety: Refrigerant – Containing Components and Accessories, Nonelectrical.”

13. Water will be provided with a tube OD of 1/2 inches. 1/2 inch tube wall thickness will be 0.016 inches. Mechanically expand tubes will form fin bond and provide burnished, work-hardened interior surface.
14. Hairpin return bend thickness on 1/2 inch tube wall thickness will be 0.016 inches as standard. Brazed return bend thicknesses will be equal to or greater than the straight tube wall thickness.
15. Water coil headers will be made of seamless copper tubing. Pipe connections will be steel threaded MPT. Header connections (tubes and piping connections) will be silver-brazed for copper and copper alloy connections and either TIG welded or silver-brazed for steel connections.
16. Provide coils with die-formed, continuous aluminum – 0.008 inch corrugated fins. Fins will have fully drawn collars to accurately space fins and protect tubes.
17. Provide coils with die-formed, continuous aluminum – 0.010 inch corrugated fins. Fins will have fully drawn collars to accurately space fins and protect tubes.

2.06 PRIMARY DRAIN PANS

A. Unit will be provided with a drain pan under each cooling coil.

B. Provide drain pan under the complete width and length of cooling coil sections. Drain pan will be full width, and extend a minimum of 6” downstream of cooling coil.

C. Drain pans for cooling coils will meet the requirements of ASHRAE 62.

D. Drain connection will be made of same material as drain pan. Dissimilar metals will not be used to mitigate risk of galvanic corrosion. Drain connection will be welded to the drain pan.

E. Drain pan will be double wall with an insulation R-value of 6.25 hr-ft2-°F/ (BTU-in).

F. Drain pan will allow visual inspection and physical cleaning on 100% of the pan surface without removal of the coil.

G. Drain pan will be provided with a minimum of 1” clearance between the drain pan and any coil casing, coil support or any other obstruction.

H. Drain pan will allows the design rate of condensate drainage regardless of fan status.

I. Drain pan will be sloped in at least two planes by at least 1/8” per foot toward a single drain. Locate drain connection at the lowest point of the pan. Pan will have no horizontal surfaces.

2.07 FANS

A. GENERAL DESCRIPTION
1. Unit[s] will be provided with fans as shown on equipment schedule and drawings.
2. Access to the fan section will be provided via an access door on the drive side of the unit.
3. Unit will be provided with vibration isolation, as scheduled.
4. Piezometer Ring: Airflow station will be factory installed at fan inlet. The device will have a measurement accuracy of ± 5%. Tubing will be field installed.

2.08 2 MULTIPLE FANS - ARRAY OF DIRECT-DRIVE PLENUM FANS - MODEL SF (STACK FAN), MANUFACTURED BY LAU.

A. Performance: Fans will conform to AMCA test standards, 205 (fan efficiency grade), 210 (air performance) and 300 (sound performance) and will bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG). Sound certification will apply to both inlet and outlet sound power levels.

B. Construction: Fans will be unhoused and incorporate a non-overloading type backward included airfoil blade wheel, heavy-gauge galvanized G90 steel frame, and front panel. The front panel will have a removable inlet cone designed for smooth airflow transition into the wheel. The motor base will be designed to endure proper alignment of the fan wheel, motor and inlet cone. The design will also ensure the structural integrity of the base to minimize vibration.

C. Wheel: Wheels will be constructed of non-overloading extruded airfoil shaped blades. Airfoil blades will be continuously welded. Wheels will have 9 blades to emphasize greater importance

on efficiency. The entire wheel will be constructed of aluminum to reduce weight and vibration. Blades will be 6061-T6 extruded aluminum. Wheel hubs will be machined aluminum made from 6061-T6 bar stock. Aluminum fan wheels will not require a finish coating. Wheels will be attached to the motor shaft using taper lock bushings. The wheel and fan inlet will be matched and have precise running tolerances for maximum performance and operating efficiency.

D. Wheel: Wheels will be constructed of non-overloading extruded airfoil shaped blades. Airfoil blades will be continuously welded. Wheels will have 12 blades to emphasize the need for better sound quality, or 9 blades with staggered spacing (RTP) to gain the benefits of both. The entire wheel will be constructed of aluminum to reduce weight and vibration. Blades will be 6061-T6 extruded aluminum. Wheel hubs will be machined aluminum made from 6061-T6 bar stock. Aluminum fan wheels will not require a finish coating. Wheels will be attached to the motor shaft using taper lock bushings. The wheel and fan inlet will be matched and have precise running tolerances for maximum performance and operating efficiency.

E. Finish and Coating: Fans will be constructed of corrosion resistant galvanized steel. Aluminum components will be unpainted.

F. Motors: Motors will meet or exceed EISA 2007 (The Energy Independence and Security ACT of 2007) efficiencies. Motors will be NEMA rated 900, 1200, 1800 or 3600 RPM in 60 Hz, Open Drip Proof (ODP) with a 1.15 service factor.

G. Motors: Motors will meet or exceed EISA 2007 (The Energy Independence and Security ACT of 2007) efficiencies. Motors will be NEMA rated 900, 1200, 1800 or 3600 RPM in 60 Hz, Totally Enclosed Fan Cooled (TEFC) with a 1.15 service factor.

H. Fan Balancing: All fans prior to shipment will be run tested at the specified operating speed. Each fan will be dynamically balanced as a complete unit in accordance with ANSI/AMCA 204-20 “Balance Quality and Vibration Levels for Fans” to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings will be taken electronically in the axial, vertical and horizontal directions. Records of each fan balance will be maintained and a written copy will be available upon request.
   1. ISO-1940
   2. “Each fan will be vibration tested before shipping, as an assembly, in accordance with AMCA 204-05. Each assembled fan will undergo a test run at the factory at the specified fan RPM. Vibration signatures will be taken on each fan bearing in the horizontal, vertical, and axial directions. The maximum allowable fan vibration level will be 0.15 in./sec. peak velocity, filter-in, at the fan RPM when the fan is rigidly mounted.”

I. I. Fan Options: The following options will be available for multiple fans:
   1. Fan Inlet Screen: Fan inlet screen will be factory installed as safety protection for limiting access to fan wheel inlet.
   2. Fan Discharge Cage: Fan discharge cage will be factory installed as safety protection for limiting access to fan wheel discharge.
   3. Piezometer Ring: Airflow station will be factory installed in each fan inlet. The device will have a measurement accuracy of ± 5%. Field-installed tubing will be manifolded so that the measurement is representative of all fans in the array.
   4. Backdraft Damper: Backdraft dampers will be available for automatic isolation of individual fans.
   5. Fan Array Motor Control: Common VFD operation
      a. All fan motors will be factory-wired to individual manual motor protection [MMP] device which will consist of a motor overload relay with adjustable current rating and an on-off disconnect switch for power isolation. Field wiring of MMP’s to fan motors will not be permitted.
      b. MMP’s will be contained in a single control panel [MMP panel] and will be mounted on the exterior wall panel of the fan array section.
   6. MMP panel will have a single point of connection for input power wiring and will feed power individual MMP’s through a common busbar. Independent wiring of input power to individual MMP’s will not be permitted.

2.09 ELECTRICAL MOTORS

A. Fan motors will be built in accordance and comply with the latest standards of the NEMA and IEEE.

B. AHU and fan motors will comply with ASHRAE 90.1.

C. Fan motors will be provided with the following characteristics:
   1. Voltage, Frequency and Phase, as scheduled.
   2. Motor RPM, as scheduled
   3. Minimum service factor of 1.15
   4. Premium efficiency, or as required to meet ASHRAE 90.1
   5. NEMA design ball bearing type
   6. Rated for continuous duty at full load in a 104°F [40°C] ambient
   7. 7. Suitable for use in variable frequency application, per NEMA MG-1 Part 30

2.10 FACTORY INSTALLED ELECTRICAL ACCESSORIES

A. In addition to motor power terminals, unit(s) will be provided with an independent power terminal for convenience receptacles and lights.

B. All switches will be provided as shown on drawings.

C. Unit[s] will be provided with integral LED (light emitting diode) lights in segments as scheduled or shown on drawings.

2.11 FILTERS

A. Unit[s] will be provided with filter segments consisting of filters and frames as scheduled.

B. Side filters for filter segments located upstream of coil segment(s) will be provided with an access door on the drive side through which filters can be easily loaded.

C. Class 2 or Class 1 filter media will be provided per U.L. 900 and as required by local codes.

D. Filter types, efficiencies, and nominal depths will be as follows:
   1. Flat filters – 2” pleated MERV 8, as scheduled.

E. Flush mounted, factory installed differential pressure gauge on the drive side of unit will be provided to measure pressure drop across filters. Manufacturer will provide fully functional gauges, complete with tubing.

2.12 DAMPERS

A. Control Dampers: Will be Ruskin Model CD60.
   1. Type: Parallel-blade.
   2. Tested according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating."
   3. Leakage: Class 1A. Leakage Rate: Not exceeding 3 cfm/sq. ft. (15 L/s· m2) at 1 inch w.g. (249.09 Pa) pressure differential.
   4. Damper Blades: Galvanized-steel airfoil-shaped, single-piece with flexible metal compressible jamb seals, extruded Ruskiprene blade edge seals, and stainless-steel sleeve bearings mounted in a single galvanized-steel frame.
   5. Axles: Hexagonal. Positively locked into the damper blade.
   6. Dampers are to be provided with a jackshaft.

B. Airflow Monitoring Dampers: Will be Ruskin Model AMS060. Dampers will be parallel-blade, leakage Class 1A design with a leakage rate that will not exceed 3 cfm/sq. ft. (15 L/s· m2) at 1 in. w.g. (249.09 Pa) pressure differential when tested according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating." Dampers will have galvanized-steel airfoil-shaped, single-piece blades with flexible metal compressible type jamb seals, extruded Ruskiprene blade edge seals, and stainless-steel sleeve bearings mounted in a single galvanized-steel frame. Dampers will be provided with a jackshaft. Airflow monitoring stations will be tested to AMCA Standard 610 and 611 and will be qualified to bear the AMCA Ratings Seal for Airflow Measurement Station Air Performance.

1. Damper will include airfoil shaped, heavy gage, anodized aluminum monitoring blades which are fixed within the damper frame and contain air pressure sensing ports.
2. Damper will include a 3000 series aluminum alloy honeycomb air straightener contained in a galvanized steel sleeve attached to the monitoring blade frame.
3. Airflow Monitoring Options:
   100 Percent: Damper will consist of a single section of monitoring blades and air straightener covering 100 percent of the damper face area.

2.13 UVC FIXTURES

A. A. Fixtures have been tested, listed and labeled as UL/C-UL under Category Code ABQK (Accessories, Air Duct Mounted), UL Standards: 153, 1598 & 1995 respectively.

B. Fixtures meet the “UL” drip proof design and each fixture is equipped with an electrical interlock.

C. Each lamp contains no more than 5.5 milligrams of mercury consistent with current environmental practices while producing the specified output at 500 fpm in temperatures of 55-135° F.

D. Useful lamp life will be 9000 hours with no more than a 20% output loss at the end of one year of continuous use. They are constructed with UVC proof metal bases and will not produce ozone.

2.14 AIRFLOW MONITORING STATIONS

A. Optional airflow monitoring stations will be provided on air inlets, as shown in performance specifications.

B. Airflow monitoring stations will bear the AMCA Certified Ratings Seal for Airflow Measurement Performance.

C. Airflow monitoring station dampers will comply with leakage rates per ASHRAE 90.1.

D. Airflow monitoring stations will be accurate within 5% of actual airflow between 300 FPM and 3000 FPM free area velocity.

E. Factory installed transducer that sends a CFM-proportional, 4-20 mA or 0-10V signal will be provided only when factory packaged controls option is selected.

2.15 APPURTENANCES

A. Safety grates over bottom openings will be provided, as shown on drawings. Safety grates will be capable of supporting a 300 lb. center load.

B. Lifting lugs will be provided where required.

2.16 EXTERIOR FINISHES

A. Unpainted air-handling units constructed of galvanized steel will show a breakdown of less than 1/8” on either side of a scribed line when subjected to ASTM B117 220 hour, 5% salt spray conditions. This is equivalent to an ASTM D1654 rating of ‘6.’ Also, per ASTM D610, degree of rusting to meet #8-G and per ASTM D714 degree of blister to meet #6 medium.

2.17 LIGHTS AND OUTLETS

A. Lights
   1. Factory will provide integral LED lighting fixture located in segments and quantity as indicated on the drawings.
   2. Factory will wire all light fixtures to a common 120v switch located on the supply fan segment.

END OF SECTION

SECTION 237423
MODULAR DEDICATED OUTSIDE AIR SYSTEM

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

C. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.

D. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2008 (Reapproved 2019).

E. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints; 2025.

F. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments; 2024.

G. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

K. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

L. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.02 SECTION INCLUDES

A. Indoor air handling units and components as scheduled and shown on drawings.

B. Motor disconnects, motor starters, and variable frequency drives.

1.03 RATINGS AND CERTIFICATIONS

A. Unit will conform to E.T.L. standards. Unit will be ETL listed.

B. Unit will conform to AMCA 210 for fan performance ratings.

C. Unit will conform to AHRI 410 for capacities, pressure drops, and selection procedures of air coils.

D. Unit will conform to ANSI/AHRI 430 for all fabrication procedures of air handling units. Unit will have airflow performance certified to ANSI/AHRI 430.

E. Motors covered by the Federal Energy Policy Act (EPACT) will meet EPACT requirements.

F. Damper performance will comply with AMCA 500.

G. Unit will be ISO 9001 certified.

H. Unit will be manufactured in an ISO 9002 certified facility.

I. Filter media to comply with ANSI/UL 900 listed Class I or Class II.

J. Control Wiring comply with NEC codes & ETL requirements.

K. Unit will comply with energy use AHSRAE 90.1.

1.04 WARRANTY

A. Include factory-provided controls in the parts warranties.

B. Unit will be covered by a limited parts (18 months (12 months from start-up)) and labor (18 months (12 months from start-up)) warranty from date of shipment . Warranty will cover

manufacturer defects. Warranty work will be performed by manufacturer's factory-trained and factory-employed technician.

C. Parts associated with routine maintenance, such as belts and air filters will be excluded.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

A. Air Handling Unit (AHU) will consist of a structural base, insulated casing, access doors, fans, motors, motor controls, coils, filters, dampers, controls, components, and accessories; as shown on drawings, schedules, and specifications.

B. Unit will meet the specified levels of performance for scheduled items including airflow, static pressure, cooling capacity, heating capacity, electrical characteristics, sound, casing leakage, panel deflection and casing thermal performance.

C. Unit will maintain structural integrity when wall panels are removed.

D. Internal components and accessories will be as specified and scheduled (unless noted otherwise). Components and accessories will be installed by the AHU manufacturer in an ISO-9002 certified facility.

E. Unit will be shipped in one piece or with shipping spltis necessary for shipping and installation.

F. Manufacturer will provide detailed, step-by-step instructions for disassembly and reassembly.

2.02 BASE RAIL

A. Unit will be provided with base rail and lifting lug system that does not require additional support for rigging. Include base rail lifting lugs at unit corners.

B. Unit will be provided with a 6" structural base rail under the full perimeter of the unit, formed from mill galvanized steel.

2.03 CASING

A. Casing construction will not rely on the casing panels for structural integrity.

B. Casing panels will be 2" double-wall construction with thermal break. Thermal break will be between interior and exterior liner of the panel assembly, and between the panel and casing framework.

C. Provide casing with minimum thermal resistance (R-value) of 16 hr-ft2-°F/BTU. Exposed insulation is not acceptable.

D. Casing panel insulation will be injected polyurethane foam. Foam insulation will be manufactured by EcoMate®. Rigid foam board panels will not be used.

E. All exterior casing panels (roof, wall, floor, access door) will be made of G90 galvanized steel. All interior casing panels (roof, wall, floor, access door) will be made of G90 galvanized steel.

F. Panel assembly will meet UL standard 60336-2-40 for fire safety. Panel insulation will comply with the requirements of NFPA 90A.

G. Insulation system provided will be resistant to mold growth in accordance with a standardized test method such as UL 181 or ASTM C1338.

H. Encapsulate insulation with sheet metal so that air does not contact insulation. Solid lined double-walled panels insulated with injected foam will be hermetically sealed at each corner and around their entire perimeter to eliminate airflow through the panel and to eliminate microbial growth potential within the casing wall.

I. Unit will conform to ASHRAE Standard 111 Class 6 for casing leakage of no more than 1% of design airflow at 1.25 times design static pressure up to a maximum of +8 inches w.g. in positive pressure sections and -8 inches w.g. in negative pressure sections down to a minimum of 50 CFM measurable leakage at or 5,000 design CFM.

J. Unit will be provided with wall panels and access doors that deflect no more than L/240 when subjected to 1.5 times design static pressure up to a maximum of +8 inches w.g. in positive

pressure sections and -8 inches w.g. in negative pressure sections. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

K. Unit will be provided with floors and roofs that deflect no more than L/240 when subjected to a 300 lb static load at mid-span. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.

2.04 ACCESS DOORS

A. Unit will be provided with double wall access door(s) that meet requirements for the AHU casing.

B. Unit will be provided with industrial-style stainless steel hinges that permit 180 degrees of door swing.

C. Unit will be provided with latches with roller cam mechanisms that ensure a tight seal. Rotating knife-edge or “paw” latches are not acceptable.

D. Unit will be provided with each door with a single handle linked to multiple latching points or a separate handle for each latching point. Doors serving access segments will have an interior latch handle.

E. Unit will be provided with access doors with a locking hasp to accommodate a lockout device.

2.05 COILS: HEATING AND COOLING

A. Coil will be manufactured by the same manufacturer as the AHU manufacturer, except where noted in contract documents.

2.06 GENERAL DESCRIPTION

A. Coil will meet or exceed performance scheduled on drawings.

B. Coil will be provided with performance certified in accordance with AHRI Standard 410 for coil capacity and pressure drop, wherever applicable. Coils circuits will be designed such that the fluid velocity is within the range of certified rating conditions at design flow.

C. Cooling coils will be provided with a maximum face velocity as scheduled. Face velocity calculations will be based on the finned area of the coil.

D. Cooling coil will be provided with drain pan that is sufficient to contain coil condensate. Drain pan will extend a minimum of 6” downstream of the face of the coil.

E. Coil segment casing will accommodate full-face coils as scheduled.

F. Access doors will be located to provide clearance for pipe insulation, connectors, and accessories. Space will allow a minimum of 90 degrees of door swing.

G. Coils will be built in their own G90 galvanized steel full perimeter frame. Tube sheets on each end will have fully drawn collars to support and protect tubes. Horizontal coil casing and support members will allow moisture to drain. Bulkhead support will be G90 galvanized steel and will not block finned area.

H. Individual coils will be removable from the side of the AHU.

I. A single intermediate vertical coil support will be provided on coils with a finned length greater than 62”. Two vertical supports will be provided on coils with a finned length greater than 100”, and three vertical supports on coils with a finned length greater than 141”. Intermediate vertical coil support will be same material as the casing.

J. Gap between coil stub out connection and AHU casing, will be insulated with a spool-shaped sleeve grommet. Adhesive rings applied to the casing walls will not be acceptable.

K. Water coils will be operable at 325 psig working pressure and up to 250 °F. Factory test water coils with 325 psig compressed air under water. Water coils will conform to Subsection 12.3, “Water-Containing Parts,” of UL 207, “Standard for Safety: Refrigerant – Containing Components and Accessories, Nonelectrical.”

L. Water will be provided with a tube OD of 1/2 inches. 1/2 inch tube wall thickness will be 0.016 inches. Mechanically expand tubes will form fin bond and provide burnished, work-hardened interior surface.

M. Hairpin return bend thickness on 1/2 inch tube wall thickness will be 0.016 inches as standard. Brazed return bend thicknesses will be equal to or greater than the straight tube wall thickness.

N. Water coil headers will be made of seamless copper tubing. Pipe connections will be steel threaded MPT. Header connections (tubes and piping connections) will be silver-brazed for copper and copper alloy connections and either TIG welded or silver-brazed for steel connections.

O. Provide coils with die-formed, continuous aluminum – 0.008 inch corrugated fins. Fins will have fully drawn collars to accurately space fins and protect tubes.

P. Provide coils with die-formed, continuous aluminum – 0.010 inch corrugated fins. Fins will have fully drawn collars to accurately space fins and protect tubes.

2.07 PRIMARY DRAIN PANS

A. Unit will be provided with a drain pan under each cooling coil.

B. Provide drain pan under the complete width and length of cooling coil sections. Drain pan will be full width, and extend a minimum of 6” downstream of cooling coil.

C. Drain pans for cooling coils will meet the requirements of ASHRAE 62.

D. Drain connection will be made of same material as drain pan. Dissimilar metals will not be used to mitigate risk of galvanic corrosion. Drain connection will be welded to the drain pan.

E. Drain pan will be double wall with an insulation R-value of 6.25 hr-ft2-°F/ (BTU-in).

F. Drain pan will allow visual inspection and physical cleaning on 100% of the pan surface without removal of the coil.

G. Drain pan will be provided with a minimum of 1” clearance between the drain pan and any coil casing, coil support or any other obstruction.

H. Drain pan will allows the design rate of condensate drainage regardless of fan status.

I. Drain pan will be sloped in at least two planes by at least 1/8” per foot toward a single drain. Locate drain connection at the lowest point of the pan. Pan will have no horizontal surfaces.

2.08 FANS

A. GENERAL DESCRIPTION
   1. Unit[s] will be provided with fans as shown on equipment schedule and drawings.
   2. Access to the fan section will be provided via an access door on the drive side of the unit.
   3. Mount the DDP fan and motor assembly on a common adjustable base. This common base will attach to vibration isolators, which mount to structural support channels. These channels will span the AHU floor and mount directly to the AHU frame. Manufacturers not complying with this requirement must submit detailed structural and weight data to a licensed structural engineer for review and stamped certification. The mechanical engineer will review these engineers’ final reports prior to submittal approval.
   4. Unit will be provided with vibration isolation, as scheduled.
   5. Unit will be provided with horizontal thrust restraints between AHU casing and fan housings with end discharge. This requirement applies to the following cases:
   6. Piezometer Ring: Airflow station will be factory installed at fan inlet. The device will have a measurement accuracy of ± 5%. Tubing will be field installed.

2.09 DIRECT-DRIVE FANS (SINGLE 1X1) MODEL DDPG2, MANUFACTURED BY LAU

A. Plenum (SWSI) Fan
   1. Plenum fan wheel will be single-width, single-inlet, with 9 blades.
   2. Plenum fan blades will be aluminum backward-inclined airfoil.
   3. Plenum fan will be direct-driven.

2.10 ELECTRICAL MOTORS

A. Fan motors will be built in accordance and comply with the latest standards of the NEMA and IEEE.

B. AHU and fan motors will comply with ASHRAE 90.1.

C. Fan motors will be provided with the following characteristics:
   1. Voltage, Frequency and Phase, as scheduled.
   2. Motor RPM, as scheduled
   3. Minimum service factor of 1.15
   4. Premium efficiency, or as required to meet ASHRAE 90.1
   5. NEMA design ball bearing type
   6. Rated for continuous duty at full load in a 104°F [40°C] ambient
   7. Suitable for use in variable frequency application, per NEMA MG-1 Part 30

2.11 FAN-MOTOR VARIABLE FREQUENCY DRIVES (VFDS)

A. Manufacturer will provide UL or ETL listed VFDs and associated components, as scheduled and shown on drawings. VFDs will comply with applicable provisions of the National Electric Code.

B. VFDs shall be mounted on the malls of the mechanical room.

C. Unit(s) will be provided with following VFD disconnect and bypass optional:
   1. Fused main disconnect

D. Unit(s) will be provided with harmonic distortion feedback protection:
   1. Equivalent 5% impedance input line reactor
   2. Integral RFI/EMI filtering to meet EMC EN61800-3 for First Environment

E. Unit(s) will be provided with a user interface consisting of following features:
   1. 1. 30 Character multi-lingual alphanumeric display
   2. Parameter set-up and operating data
   3. Display data will include:
      a. output frequency (Hz)
      b. speed (RPM)
      c. motor current
      d. calculated % motor torque
      e. calculated motor power (kW)
      f. DC bus voltage
      g. output voltage
      h. heat sink temperature
      i. elapsed time meter (re-settable)
      j. kWh (re-settable)
      k. input / output terminal monitor
      l. PID actual value (feedback) & error
      m. fault text
      n. warning text
      o. scalable process variable display

F. VFD will be provided with the following protection circuits:
   1. over current
   2. ground fault
   3. . over voltage
   4. under voltage
   5. over temperature
   6. input power loss of phase
   7. loss of reference/feedback
   8. adjustable current limit regulator

G. VFD will be UL 508C approved for electronic motor overload (12t).

H. VFD will be provided with features for high input transient protection and surge suppression, such as
   1. 4 MOVs ahead of diode bridge
   2. 120 Joule rated 1600V diode module
   3. Compliant with UL 1449 / ANSI 61.4

I. VFD will be provided with the following communication features:
   1. Two programmable analog inputs
   2. Six programmable digital inputs
   3. Two programmable analog output
   4. Three programmable digital relay outputs
   5. Modbus RTU Communications protocol
   6. Adjustable filters on analog inputs and outputs
   7. Input speed signals, including 4-20 mA and 0-10 VDC
   8. Accel/Decel contacts [floating point control]
   9. Auto restart [customer selectable and adjustable]
   10. Start/Stop options will include [2 wire dry contact closure], [3 wire momentary contacts], application of input power, and application of reference signal (PID sleep/wake-up).
   11. Integrated control interface for Siemens FLN, Johnson N2, Modbus RTU, BACnet MS/TP or LONWorks over RS-485.

J. L. VFD will consist of the following functions:
   1. Pre-magnetization on start
   2. DC braking/hold at stop
   3. Ramp or coast to stop
   4. Seven preset speeds
   5. Three critical frequency lockout bands
   6. Start function will include ramp, flying start, automatic torque boost, and automatic torque boost with flying start

2.12 FACTORY INSTALLED ELECTRICAL ACCESSORIES

A. In addition to motor power terminals, unit(s) will be provided with an independent power terminal for convenience receptacles and lights.

B. All switches will be provided as shown on drawings.

C. Unit[s] will be provided with integral LED (light emitting diode) lights in segments as scheduled or shown on drawings.

2.13 FILTERS

A. Unit[s] will be provided with filter segments consisting of filters and frames as scheduled.

B. Side filters for filter segments located upstream of coil segment(s) will be provided with an access door on the drive side through which filters can be easily loaded.

C. Class 2 or Class 1 filter media will be provided per U.L. 900 and as required by local codes.

D. Filter types, efficiencies, and nominal depths will be as follows:
   1. Flat filters – 4” MERV 8 pleated filters, as scheduled.

E. E. Flush mounted, factory installed differential pressure gauge on the drive side of unit will be provided to measure pressure drop across filters. Manufacturer will provide fully functional gauges, complete with tubing.

2.14 DAMPERS

A. Airflow Monitoring Dampers: Will be Ruskin Model AMS060. Dampers will be parallel-blade, leakage Class 1A design with a leakage rate that will not exceed 3 cfm/sq. ft. (15 L/s· m2) at 1 in. w.g. (249.09 Pa) pressure differential when tested according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating." Dampers will have galvanized-steel airfoil-shaped,

single-piece blades with flexible metal compressible type jamb seals, extruded Ruskiprene blade edge seals, and stainless-steel sleeve bearings mounted in a single galvanized-steel frame. Dampers will be provided with a jackshaft. Airflow monitoring stations will be tested to AMCA Standard 610 and 611 and will be qualified to bear the AMCA Ratings Seal for Airflow Measurement Station Air Performance.

1. Damper will include airfoil shaped, heavy gage, anodized aluminum monitoring blades which are fixed within the damper frame and contain air pressure sensing ports.
2. Damper will include a 3000 series aluminum alloy honeycomb air straightener contained in a galvanized steel sleeve attached to the monitoring blade frame.
3. Airflow Monitoring Options:
    a. 100 Percent: Damper will consist of a single section of monitoring blades and air straightener covering 100 percent of the damper face area.

2.15 INTEGRAL FACE AND BYPASS COIL

A. General

1. Furnish type IFB integral face and bypass coils as manufactured by L.J. Wing, Dallas, TX, to heat air using hot water as the heating medium.
2. Performance will be ARI-certified and as shown in the schedule.
3. Each heating coil will consist of built-in series of finned heating elements and bypasses with interlocked dampers controlled by electric damper motor(s).
4. Dampers are to be arranged so as to completely enclose and isolate the heating coil passes when no temperature rise is required.
5. Each coil will be capable of maintaining a constant discharge air temperature regardless of variations in entering air temperatures with full water flow at all times.
6. Actuators are to be side-mounted.
7. Proportioning of the air will be such that the temperature at any point in a plane parallel to the face of the coil two feet (with optional anti- stratification baffles installed) downstream from the leaving air side will not vary more than +/- 5° F from the average discharge air stream temperature.
8. Finned heating elements will be fabricated of seamless return bend type 5/8" o.d. coppertubes of 0.035" wall thickness with rectangular fins of 0.010" thick aluminum.
9. Fins will not be spaced closer than 9 fins per inch.
10. Each tube will be secured to the headers by a brazed joint.
11. Each tube will be secured to the steel headers by a brazed joint with provision for 3/8" inch individual tube expansion and contraction by means of an optional flexible connector (VIFB)
12. Finned elements will be factory tested with 500 psig hydrostatic pressure.
13. Unit casing and dampers will be fabricated of heavy gauge galvanized steel.
14. Headers will be three-inch diameter, SCH 40 steel pipe.

2.16 UVC FIXTURES

A. Fixtures have been tested, listed and labeled as UL/C-UL under Category Code ABQK (Accessories, Air Duct Mounted), UL Standards: 153, 1598 & 1995 respectively.

B. Fixtures meet the “UL” drip proof design and each fixture is equipped with an electrical interlock.

C. Each lamp contains no more than 5.5 milligrams of mercury consistent with current environmental practices while producing the specified output at 500 fpm in temperatures of 55-135° F.

D. Useful lamp life will be 9000 hours with no more than a 20% output loss at the end of one year of continuous use. They are constructed with UVC proof metal bases and will not produce ozone.

2.17 AIRFLOW MONITORING STATIONS

A. Optional airflow monitoring stations will be provided on air inlets, as shown in performance specifications.

B. Airflow monitoring stations will bear the AMCA Certified Ratings Seal for Airflow Measurement Performance.

C. Airflow monitoring station dampers will comply with leakage rates per ASHRAE 90.1.

D. Airflow monitoring stations will be accurate within 5% of actual airflow between 300 FPM and 3000 FPM free area velocity.

E. Factory installed transducer that sends a CFM-proportional, 4-20 mA or 0-10V signal will be provided only when factory packaged controls option is selected.

2.18 APPURTENANCES

A. Safety grates over bottom openings will be provided, as shown on drawings. Safety grates will be capable of supporting a 300 lb. center load.

B. Lifting lugs will be provided where required.

2.19 EXTERIOR FINISHES

A. Unpainted air-handling units constructed of galvanized steel will show a breakdown of less than 1/8” on either side of a scribed line when subjected to ASTM B117 220 hour, 5% salt spray conditions. This is equivalent to an ASTM D1654 rating of ‘6.’ Also, per ASTM D610, degree of rusting to meet #8-G and per ASTM D714 degree of blister to meet #6 medium.

2.20 LIGHTS AND OUTLETS

A. Lights
   1. Factory will provide integral LED lighting fixture located in segments and quantity as indicated on the drawings.
   2. Factory will wire all light fixtures to a common 120v switch located on the supply fan segment.

END OF SECTION

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air cooled condensing units.

B. Indoor air handling (fan and coil) units for ducted systems.

C. Controls.

1.02 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NEMA MG 00001 - Motors and Generators; 2024.

F. NFPA 54 - National Fuel Gas Code; 2024.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

I. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2024.

J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Design Data: Indicate refrigerant pipe sizing.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.02 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Upflow.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.03 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Comply with AHRI 210/240.
   2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.
   3. Refrigerant: R-454B.
   4. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   5. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
   1. Condenser Fans: Direct-drive propeller type.

C. Coil: Air-cooled, aluminum fins bonded to copper tubes.

D. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.
   2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

F. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches (100 mm) square; minimum of two located under cabinet feet.

2.04 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from setpoint.
   3. Thermostat Display:
      a. Time of day.
      b. Actual room temperature.

c. Programmed temperature.
d. Programmed time.
e. Duration of timed override.
f. Day of week.
g. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 238200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fan-coil units.

1.02 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. AHRI 440 - Performance Rating of Room Fan-Coils; 2008.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FAN-COIL UNITS

A. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.
   3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
   4. Equipment wiring to comply with requirements of NFPA 70.

B. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Water Coil: Suitable for working temperatures not less than 200 degrees F (93 degrees C).
   3. Provide drain pan under cooling coil easily removable for cleaning.

D. Coil Piping Packages:
   1. Hoses:
      a. Provide hoses for all units for connection to main water supply and return headers.
      b. Length: 2 feet (0.61 m).
      c. Material: Braided stainless steel rated to minimum 400 psi (3,758 kPa) at 265 degrees F (129.4 degrees C).
   2. Automatic Balancing Valves:
      a. Brass body for shutoff and hydronic balancing.
   3. Ball Valves:
      a. Brass body for shutoff and hydronic balancing.
      b. Provide pressure/temperature ports.
   4. Y Strainers:

a. Bronze body.
b. "Y" type configuration with brass cap.
c. Maximum Operating Pressure: Minimum 450 psi (3103 kPa).
d. Screen: Stainless steel.

E. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

H. Controls:
1. Provide units with control valves furnished by the fan coil unit manufacturer.

I. Filter: Easily removed 1 inch (25 mm) thick glass fiber throw-away type, located to filter air before coil.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Do not damage equipment or finishes.

D. Fan-Coil Units:
1. Install as indicated.
2. Coordinate to ensure correct recess size for recessed units.

E. Units with Hydronic Coils:
1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
2. Provide float operated automatic air vents with stop valve for fan coil units.

F. Units with Cooling Coils: Connect drain pan to condensate drain.

3.03 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

3.04 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Variable-frequency drive cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Wire pulling lubricant.

H. Cable ties.

I. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

D. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

T. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
   1. Exceptions:
      a. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.

C. Nonmetallic-sheathed cable is not permitted.

D. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
   1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
c. Use single-conductor wiring for panelboard feeders..

2. In addition to other applicable restrictions, may not be used:
   a. Unless approved by Owner.
   b. Where not approved for use by the authority having jurisdiction.
   c. Where exposed to view.
   d. Where exposed to damage.
   e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. Isolated Ground, All Systems: Green with yellow stripe.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.
      c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
      d. Service Wire Co: www.servicewire.com/#sle.
      e. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2 or THHN/THWN-2.

2.04 METAL-CLAD CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Service Wire Co: www.servicewire.com/#sle.
   4. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN/THWN or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

H. Provide PVC jacket applied over cable armor.

2.05 VARIABLE-FREQUENCY DRIVE CABLE

A. Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.

B. Conductor Stranding: Stranded.

C. Insulation Voltage Rating: 1000 V.

D. Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.

E. Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.

F. Provide metallic shielding.

G. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.06 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

F. Mechanical Connectors: Provide bolted type or set-screw type.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.07 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Wire Pulling Lubricant:
   1. Listed and labeled as complying with UL 267.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

D. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground plate electrodes.

1.02 RELATED REQUIREMENTS

A. Section 096900 - Access Flooring.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. For signal reference grids, coordinate the work with access flooring furnished in accordance with Section 096900.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Ground Rod Electrode(s):
      a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 4 by 12 inches (6 by 100 by 300 mm) unless otherwise indicated or required.

b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.

H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

F. Ground Plate Electrodes:
   1. Material: Copper.
   2. Size: 24 by 24 by 1/4 inches (610 by 610 by 6 mm), unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches (750 mm).

E. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

F. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported

with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Stainless steel rigid metal conduit (RMC).

C. Aluminum rigid metal conduit (RMC).

D. Galvanized steel intermediate metal conduit (IMC).

E. Stainless steel intermediate metal conduit (IMC).

F. PVC-coated galvanized steel rigid metal conduit (RMC).

G. Flexible metal conduit (FMC).

H. Liquidtight flexible metal conduit (LFMC).

I. Galvanized steel electrical metallic tubing (EMT).

J. Stainless steel electrical metallic tubing (EMT).

K. Aluminum electrical metallic tubing (EMT).

L. Rigid polyvinyl chloride (PVC) conduit.

M. Reinforced thermosetting resin conduit (RTRC).

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 078400 - Firestopping.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

K. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

P. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

Q. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

R. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

S. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

T. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

U. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

V. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

W. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
   5. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
   1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

J. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

K. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
1. Exterior locations subject to severe physical damage include, but are not limited to:
a. Where exposed to vehicular traffic below 20 feet (6.1 m).

L. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

M. Flexible Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Vibrating equipment includes, but is not limited to:
a. Transformers.
b. Motors.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
3. Underground, Exterior: 1-inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).

C. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.08 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.09 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.10 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.

2.11 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Connectors and Couplings: Use compression/gland or set-screw type.

2.12 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
2. Material: Use aluminum.
3. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.

2.13 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.14 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.15 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

F. Conduit Mechanical Seals:
1. Listed as complying with UL 514B.

2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
3. Suitable for sealing around conductors/cables to be installed.

G. Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
a. Electrical rooms.
b. Mechanical equipment rooms.
c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
a. Across floors.
b. Across roofs.
c. Across top of parapet walls.
d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
13. Group parallel conduits in same area on common rack.

H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

K. Underground Installation:
   1. Provide trenching and backfilling; see Section 312316.13.
   2. Minimum Cover, Unless Otherwise Indicated or Required:
      a. Underground, Exterior: 24 inches (610 mm).
   3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 260553.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated; see Section 033000.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

N. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

P. Provide grounding and bonding; see Section 260526.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.

G. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 262726.
13. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.
    b. Hubbell Incorporated; Bell Products; _____: www.hubbell-rtb.com/#sle.
    c. Hubbell Incorporated; RACO Products; _____: www.hubbell-rtb.com/#sle.
    d. Thomas & Betts Corporation; _____: www.tnb.com/#sle.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
4. Manufacturer: Same as manufacturer of floor box service fittings.

E. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
4. Applications:
    a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
      b. Communications Systems Outlets: Comply with Section 271000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
   9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
   10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.
      c. Electrical rooms.
      d. Mechanical equipment rooms.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Underground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
   2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 260526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260536
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal cable tray systems:
   1. Metal ladder cable tray.
   2. Metal ventilated trough cable tray.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA BI-50016 - Cable Tray Installation Guidelines; 2024.

C. NEMA BI 50015 - Metal Cable Tray Systems; 2024.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts. Coordinate work to avoid installation of obstructions within cable tray required clearances.
   2. Coordinate arrangement of cable tray with dimensions and clearance requirements of actual products to be installed.
   3. Coordinate work with placement of supports and anchors required for mounting.
   4. Notify of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.

C. Sequencing:
   1. Do not begin installation of cables until installation of associated cable tray run is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA BI-50016, except do not store cable tray outdoors without cover as permitted in NEMA BI-50016.

B. Handle products carefully to avoid damage to finish.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of required components, fittings, supports, and accessories, as necessary for complete system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under service conditions at installed location.

E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (i.e., no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA BI 50015.

F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA BI 50015 including applicable allowable tolerances.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage cable tray system has been completed.

B. Verify field measurements.

C. Verify dimensions and span/load ratings of cable tray system components.

D. Verify that mounting surfaces are ready to receive cable tray and associated supports.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install cable tray in accordance with NECA 1 (general workmanship) and NEMA BI-50016.

C. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.

D. Arrange cable tray to provide required clearances and maintain cable access.

E. Install cable tray plumb and level, with sections aligned and with horizontal runs at specified elevation.

F. Cable Tray Movement Provisions:
   1. Provide expansion fittings where cable tray is subject to movement, including but not limited to:
      a. Where cable tray crosses structural joints intended for expansion.
      b. Long straight cable tray runs in accordance with NEMA BI-50016.
   2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA BI-50016.
   3. Set gaps for expansion fittings in accordance with NEMA BI-50016.

G. Cable and Conductors:
   1. Ampacity: As determined by applications listed in NFPA 70.

H. Cable Provisions:
   1. Use fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
   2. Use drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
   3. Use cable support fittings for long vertical cable tray runs with heavy cables.

I. Provide end closures at unconnected ends of cable tray runs.

J. Cable Tray Support:

1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA BI-50016 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment where not furnished by cable tray manufacturer.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

K. Grounding and Bonding Requirements:
1. Comply with grounding and bonding requirements of NEMA BI-50016.
2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified cable tray connectors to provide electrical continuity. Do not use classified cable tray connectors where cable tray sections have been modified, such as being bent, cut, or reshaped.
3. Provide suitable equipment grounding conductor in each metal cable tray, except where cable tray contains only multiconductor cables with integral equipment grounding conductors. Do not use metal cable tray system as sole equipment grounding conductor.

L. Penetrations: Install firestopping to preserve fire resistance rating of building elements.

M. Identification Requirements:

N. Install cable tray covers where indicated and as follows:
1. For first 6 ft (1.8 m) of cable tray extending vertically from floor penetration.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect cable tray system for damage and defects.

C. Correct deficiencies and replace damaged or defective cable tray system components.

3.04 ADJUSTING

A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Remove dirt and debris from cable tray.

B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 PROTECTION

A. Protect cable tray system from subsequent construction operations.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 260536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use identification nameplate to identify main overcurrent protective device.
         5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Panelboards:
    1) Identify ampere rating.
    2) Identify voltage and phase.
    3) Identify power source and circuit number. Include location when not within sight of equipment.
    4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
    5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
    6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
c. Enclosed switches, circuit breakers, and motor controllers:
    1) Identify voltage and phase.
    2) Identify power source and circuit number. Include location when not within sight of equipment.
    3) Identify load(s) served. Include location when not within sight of equipment.
d. Enclosed Contactors:
    1) Identify ampere rating.
    2) Identify voltage and phase.
    3) Identify load(s) and associated circuits controlled. Include location.
e. Centralized Emergency Lighting Inverters:
    1) Identify input and output voltage and phase.
    2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
    3) Identify load(s) served. Include location.

2. Service Equipment:
    a. Use identification nameplate to identify each service disconnecting means.
3. Emergency System Equipment:
    a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    c. Service Equipment: Include the following information in accordance with NFPA 70.

1) Nominal system voltage.
2) Available fault current.
3) Date label applied.

7. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
a. Within boxes when more than one circuit is present.
b. Within equipment enclosures when conductors and cables enter or leave the enclosure.

C. Identification for Raceways:
1. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
a. Maximum Intervals: 20 feet (6.1 m).
b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
1) Field-Painting: Comply with Section 099123 and 099113.
2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
c. Color Code:
1) Fire Alarm System: Red.

D. Identification for Devices:
1. Use identification label to identify fire alarm system devices.
2. Use identification label to identify serving branch circuit for all receptacles.
a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
2. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Minimum Size:
   1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

C. Legend:
   1. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
   2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260573
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

1.02 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Submit study reports prior to or concurrent with product submittals.
   2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

1.05 POWER SYSTEM STUDIES

A. Scope of Studies:
   1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
   2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:

1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
        1) Obtain up-to-date information from Utility Company.
    b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
    c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
    d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
    e. Protective Devices:
        1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
        2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
    f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
    g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
    a. Maximum utility fault currents.
    b. Maximum motor contribution.
    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    a. Maximum and minimum utility fault currents.
    b. Maximum and minimum motor contribution.
    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

F. Study Reports:
1. General Requirements:
    a. Identify date of study and study preparer.
    b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
d. Identify base used for per unit values.
e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
f. Include conclusions and recommendations.

2. Short-Circuit Study:
   a. For each scenario, identify at each bus location:
      1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
      2) Fault point X/R ratio.
      3) Associated equipment short circuit current ratings.
   b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Arc Flash and Shock Risk Assessment:
   a. For the worst case for each scenario, identify at each bus location:
      1) Calculated incident energy and associated working distance.
      2) Calculated arc flash boundary.
      3) Bolted fault current.
      4) Arcing fault current.
      5) Clearing time.
      6) Arc gap distance.
   b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.06 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 260553.
   2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Nominal system voltage.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260533.16.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

C. Lighting contactors.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260573 - Power System Studies.

E. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

F. Section 265100 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

H. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
   2. Coordinate placement of wall switch occupancy sensors with installed door swings.
   3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
   4. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
   5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Hubbell Incorporated: www.hubbell.com/#sle.
   3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   4. RAB Lighting, Inc: www.rablighting.com/#sle.
   5. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
   5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   6. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

C. Wall Switch Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).

D. Ceiling Mounted Occupancy Sensors:
1. General Requirements:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

E. Power Packs for Low-Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control load indicated on drawings.

2.03 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.04 LIGHTING CONTACTORS

A. Manufacturers:
1. ABB; _____: www.electrification.us.abb.com/#sle.
2. Eaton Corporation; _____: www.eaton.com/#sle.
3. Rockwell Automation Inc; _____: www.rockwellautomation.com/#sle.
4. Schneider Electric; _____: www.se.com/#sle.
5. Siemens Industry, Inc; _____: www.new.siemens.com/#sle.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on drawings.

C. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than available fault current at installed location as determined by short circuit study performed in accordance with Section 260573.

D. Enclosures:
1. Comply with NEMA IA 10030.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish: Manufacturer's standard unless otherwise indicated.

2.05 ACCESSORIES

A. Fire-Rated Device Enclosures:
1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
   2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Maintain separation of remote-control, signaling, and power-limited circuits.
   1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances:
   1. See Section 012100 - Allowances, for allowances affecting this section.
   2. Include cash allowance for Utility Company charges associated with providing service.

1.04 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Owner.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
   1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: To be determined by Contractor.

D. Division of Responsibility: Per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components in accordance with Section 260529.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.

F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

END OF SECTION

SECTION 262413
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262100 - Low-Voltage Electrical Service Entrance.

F. Section 264300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

L. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
   1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
   2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
   3. Obtain Utility Company approval of switchboard prior to fabrication.
   4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switchboards:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Schneider Electric: www.se.com/#sle.
   4. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.02 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Service Entrance Switchboards:

1. Listed and labeled as suitable for use as service equipment according to UL 869A.
2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
3. Comply with Utility Company requirements for electrical service.

E. Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
   a. Altitude: Less than 6,600 feet (2,000 m).
   b. Ambient Temperature:
      1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

H. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
3. Phase and Neutral Bus Material: Aluminum.
4. Ground Bus Material: Aluminum.

I. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:
   a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   b. Main and Neutral Lug Type: Mechanical.
2. Load Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   b. Lug Type:

J. Enclosures:
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
   b. Outdoor Locations: Type 3R.
2. Finish: Manufacturer's standard unless otherwise indicated.
3. Outdoor Enclosures:
   a. Color: Manufacturer's standard.
   b. Access Doors: Lockable, with all locks keyed alike.

K. Future Provisions:
1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list switchboards as a complete assembly including surge protective device.

M. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

N. Instrument Transformers:
   1. Comply with IEEE C57.13.
   2. Select suitable ratio, burden, and accuracy as required for connected devices.
   3. Current Transformers: Connect secondaries to shorting terminal blocks.
   4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
   1. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   2. Molded Case Circuit Breakers:
      a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
      b. Minimum Interrupting Capacity:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.
      c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
         1) Provide the following field-adjustable trip response settings:
            (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
            (b) Long time delay.
            (c) Instantaneous pickup.
      e. Provide the following circuit breaker types where indicated:
         1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
      f. Provide the following features and accessories where indicated or where required to complete installation:
         1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.04 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer cases test.
   4. Electrical operation and control wiring tests, including polarity and sequence tests.
   5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.

E. Provide required support and attachment in accordance with Section 260529.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.

H. Provide grounding and bonding in accordance with Section 260526.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Provide filler plates to cover unused spaces in switchboards.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

D. Inspect and test in accordance with NETA ATS, except Section 4.

E. Perform inspections and tests listed in NETA ATS, Section 7.1.

F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

G. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

H. Test shunt trips to verify proper operation.

I. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 264300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

N. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:
a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Aluminum or copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
1. Provide flush-mounted enclosures unless otherwise indicated.
2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
2) 14,000 rms symmetrical amperes at 480 VAC.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
7. Do not use tandem circuit breakers.

8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.07 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Provide filler plates to cover unused spaces in panelboards.

N. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
    1. Fire detection and alarm circuits.
    2. Communications equipment circuits.
    3. Intrusion detection and access control system circuits.
    4. Video surveillance system circuits.

O. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Test AFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

E. Floor box service fittings.

F. Poke-through assemblies.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260583 - Wiring Connections: Cords and plugs for equipment.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Except where explicitly permitted, substitution of combination switch-and-receptacle devices for separate switches and receptacles is not permitted.

C. Wiring Device Applications:
   1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
   2. Receptacles Installed in Dwelling Units: Use tamper-resistant receptacles.
   3. Provide GFCI protection for:
      a. Receptacles installed within 6 feet (1.8 m) of sinks.
      b. Receptacles installed in kitchens.
      c. Receptacles serving electric drinking fountains.
   4. Single Receptacles Installed on Individual Branch Circuits: Provide receptacle ampere rating equal to branch circuit rating.

D. Wiring Device Finishes:
   1. Provide wiring device finishes as described below, unless otherwise indicated.
   2. Architect to confirm final finish of all wall plates and receptacles..

2.02 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 WALL DIMMERS

A. Manufacturers:
   1. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure

preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

D. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.04 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Isolated Ground Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
   3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   4. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
   5. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

5. Tamper Resistant and Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

E. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
   2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (USB C) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.05 WALL PLATES AND COVERS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell-wiring.com/#sle.
   2. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

D. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

E. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.

2.06 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Thomas & Betts Corporation; _____: www.tnb.com/#sle.

B. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

2.07 POKE-THROUGH ASSEMBLIES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
   3. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Fan Speed Controllers: 48 inches (1200 mm) above finished floor.
      d. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide enclosed circuit breakers and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

G. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

H. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 264300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 262413 - Switchboards.

C. Section 262416 - Panelboards.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Field-Installed, Externally Mounted Surge Protective Devices:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Intermatic, Inc: www.intermatic.com/#sle.
   3. nVent ERICO: www.nvent.com/#sle.
   4. Schneider Electric: www.se.com/#sle.
   5. Surge Suppression, LLC (SSI): www.surgesuppression.com/#sle.

B. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

C. Source Limitations: Provide surge protective devices produced by single manufacturer and obtained from single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
1. Indoor clean, dry locations: Type 1.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
1. Switchboards: See Section 262413.
2. Panelboards: See Section 262416.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:
1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. Diagnostics:
   a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
   b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

D. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Lamps.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

L. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Pole-Mounted Luminaires:
   1. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   2. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
      b. Provide supplementary ground rod electrode as specified in Section 260526 at each pole bonded to grounding system as indicated.
   3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 270529
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
    a. TIA-569.
    b. NFPA 70.
    c. Requirements of authorities having jurisdiction.
    d. Data cabling to be listed as plenum and riser rated..
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Noncontinuous Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
1. Applications:
    a. Do not exceed 5 feet (1.5 m) between cable supports.
    b. Maximum Number of Cables per Cable Support:
        1) J-Hooks: 50, regardless of capacity.
    c. Allowable Cable Types:
        1) J-Hooks: Category 3, Category 5e, and Category 6.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

J. Identify independent communications component support wires above accessible ceilings, where permitted, with color distinguishable from other support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 270533.13
CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Stainless steel rigid metal conduit (RMC).
C. Aluminum rigid metal conduit (RMC).
D. Galvanized steel intermediate metal conduit (IMC).
E. Stainless steel intermediate metal conduit (IMC).
F. PVC-coated galvanized steel rigid metal conduit (RMC).
G. Flexible metal conduit (FMC).
H. Liquidtight flexible metal conduit (LFMC).
I. Galvanized steel electrical metallic tubing (EMT).
J. Stainless steel electrical metallic tubing (EMT).
K. Aluminum electrical metallic tubing (EMT).
L. Rigid polyvinyl chloride (PVC) conduit.
M. Reinforced thermosetting resin conduit (RTRC).
N. Inside-plant flexible nonmetallic communications raceway/innerduct.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.
E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
F. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.
G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
H. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
I. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
J. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
K. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
L. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
M. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
N. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.

Q. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

S. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

T. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

U. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

X. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Y. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

Z. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

AA. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

BB. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most

restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Where rigid polyvinyl chloride (PVC) conduit or high-density polyethylene (HDPE) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit where emerging from underground.
   3. Where rigid polyvinyl chloride (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
   4. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), aluminum electrical metallic tubing (EMT), or inside-plant flexible nonmetallic communications raceway/innerduct.

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

J. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

K. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.

B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 3/4-inch (21 mm) trade size.
   2. Continuous Conduit Homerun Serving One Communications Outlet Box: 1-inch (27 mm) trade size.
   3. Continuous Conduit Homerun Serving Two Communications Outlet Boxes: 1-inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).

C. PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
5. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.09 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
3. Connectors and Couplings: Use compression/gland or set-screw type.
4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.11 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
2. Material: Use aluminum.
3. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.12 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.

B. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.13 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.
1. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.14 INSIDE-PLANT FLEXIBLE NONMETALLIC COMMUNICATIONS RACEWAY/INNERDUCT

A. Description: Flexible, corrugated, nonmetallic communications raceway and associated fittings listed and labeled as complying with UL 2024; also suitable for installation as innerduct.

B. Use only with approved cables in accordance with listing.

2.15 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Galvanized Steel Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Galvanized Steel Electrical Metallic Tubing (EMT): Install in accordance with NECA 101.

G. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

H. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Communications rooms.
      c. Mechanical equipment rooms.
      d. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route exposed conduits:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of two 90-degree bend(s) between pull points.
9. Arrange conduit to provide no more than 100 feet (33 m) between pull points.
10. Arrange conduit to provide minimum bend radii in accordance with BICSI TDMM.
11. Route conduits above water and drain piping where possible.
12. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
13. Maintain recommended separation from sources of EMI greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.
14. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
15. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
16. Group parallel conduits in same area on common rack.

I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple, parallel, surface-mounted conduits.
6. Use of wire for support of conduits is not permitted.

J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are

necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and innerduct/cell, and in each conduit where cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

O. Provide grounding and bonding.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

END OF SECTION

SECTION 270536
CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal cable tray systems:
   1. Metal ladder cable tray.
   2. Metal ventilated trough cable tray.
   3. Metal solid-bottom cable tray.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 270529 - Hangers and Supports for Communications Systems.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

E. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

F. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

G. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.

H. NEMA BI-50016 - Cable Tray Installation Guidelines; 2024.

I. NEMA BI 50015 - Metal Cable Tray Systems; 2024.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts. Coordinate work to avoid installation of obstructions within cable tray required clearances.
   2. Coordinate arrangement of cable tray with dimensions and clearance requirements of actual products to be installed.
   3. Coordinate work with placement of supports and anchors required for mounting.
   4. Notify of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.

C. Sequencing:
   1. Do not begin installation of cables until installation of associated cable tray run is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable tray system components and accessories. Include dimensions, materials, fabrication details, finishes, and span/load ratings.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products carefully to avoid damage to finish.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of required components, fittings, supports, and accessories, as necessary for complete system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under service conditions at installed location.

E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (i.e., no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA BI 50015.

F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA BI 50015 including applicable allowable tolerances.

2.02 METAL CABLE TRAY SYSTEMS

A. Comply with NEMA BI 50015.

B. Material/Finishes:
   1. Zinc Electroplated Steel: Comply with ASTM B633.
   2. Mill-Galvanized Before Fabrication (Pre-Galvanized) Steel: Comply with ASTM A653/A653M, G90 coating.
   3. Hot-Dip Galvanized After Fabrication (H.D.G.A.F.) Steel: Comply with ASTM A123/A123M.
   4. Stainless Steel: Type 304 or Type 316.

C. Metal Ladder Cable Tray:
   1. Material: Mill-galvanized before fabrication (pre-galvanized) steel.
   2. Load/Fill Depth: As indicated on drawings.
   3. Span/Load Rating: As indicated on drawings.
   4. Rung Spacing: 9 inches (229 mm) on center for straight lengths.
   5. Inside Width: As indicated on drawings.
   6. Inside Radius of Fittings: 12 inches (305 mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage cable tray system has been completed.

B. Verify field measurements.

C. Verify dimensions and span/load ratings of cable tray system components.

D. Verify that mounting surfaces are ready to receive cable tray and associated supports.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.

C. Arrange cable tray to provide required clearances and maintain cable access.
   1. Maintain minimum clearance of 3 inches (75 mm) between bottom of cable tray and top of suspended ceilings, unless otherwise indicated or required by authorities having jurisdiction.
   2. Minimum Clearance Above and Adjacent to Cable Tray: 12 inches (300 mm).
      a. Minimum Clearance Under Access Floors: 2 inches (50 mm) between top of cable tray and bottom of access floor panels.
   3. Maintain recommended separation from sources of electromagnetic interference (EMI) greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.

D. Install cable tray plumb and level, with sections aligned and with horizontal runs at specified elevation.

E. Metal Wire Mesh/Basket Cable Tray: Field fabricate fittings in accordance with manufacturer's instructions, using only manufacturer-approved connectors classified for bonding.
   1. Inside Radius of Fittings: 12 inches (305 mm).

F. Hot-Dip Galvanized After Fabrication (H.D.G.A.F.) Steel Cable Tray: After cutting, drilling, or deburring, use approved zinc-rich paint to repair finish in accordance with ASTM A780/A780M.

G. Cable Tray Movement Provisions:
   1. Provide expansion fittings where cable tray is subject to movement, including but not limited to:
      a. Where cable tray crosses structural joints intended for expansion.
      b. Long straight cable tray runs in accordance with NEMA BI-50016.
   2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA BI-50016.
   3. Set gaps for expansion fittings in accordance with NEMA BI-50016.

H. Cable Provisions:
   1. Use fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
   2. Use drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
   3. Use cable support fittings for long vertical cable tray runs with heavy cables.

I. Provide end closures at unconnected ends of cable tray runs.

J. Cable Tray Support:
   1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA BI-50016, BICSI ITSIMM, and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment where not furnished by cable tray manufacturer.
   2. Provide support within 24 inches (600 mm) of each side of connection to a bend, tee, or cross in accordance with TIA-569, unless otherwise approved by Engineer.
   3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

K. Grounding and Bonding Requirements:
   1. Install cable tray grounding in accordance with the following. Where requirements differ, comply with the most stringent.
   2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified cable tray connectors to provide electrical continuity. Do not use classified cable tray connectors where cable tray sections have been modified, such as being bent, cut, or reshaped.

3. Provide suitable bonding conductor in each metal cable tray. Do not use cable tray as sole bonding conductor.

L. Cable Installation:
1. Install cables in accordance with the following. Where requirements differ, comply with most stringent.
a. BICSI ITSIMM (technology systems).
b. BICSI N1 (cabling infrastructure).
c. NEMA BI-50016 (cable tray).
2. Use appropriate cable pulling tools, applied to prevent excessive force on cable tray system and maintain minimum cable bending radius.
3. Use cable clamps or cable ties to fasten conductors/cables to vertical and horizontal runs of cable tray.
a. Distance Between Fastening Points for Vertical Runs: 18 inches (450 mm).
b. Distance Between Fastening Points for Horizontal Runs: As required to maintain spacing and confine conductor/cable within cable fill area.

M. Penetrations: Install firestopping to preserve fire resistance rating of building elements.

N. Identification Requirements:
1. Use warning labels to identify cable tray with word message "WARNING! Do Not Use As A Walkway, Ladder, Or Support For Personnel. Use Only As A Mechanical Support For Cables, Tubing and Raceways." at maximum intervals of 20 ft (6 m).

O. Install cable tray covers where indicated and as follows:

3.04 ADJUSTING

A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Remove dirt and debris from cable tray.

B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 PROTECTION

A. Protect cable tray system from subsequent construction operations.

END OF SECTION

SECTION 271000
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260536 - Cable Trays for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

E. Section 262726 - Wiring Devices.

F. Section 270533.13 - Conduit for Communications Systems.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

G. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

H. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.

I. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

J. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

K. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

L. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

M. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

N. TIA-607 - Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2024e.

O. UL 444 - Communications Cables; Current Edition, Including All Revisions.

P. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

Q. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

R. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Field Test Reports.

1.06 QUALITY ASSURANCE

A. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit: See section 270533.13.

B. Cable Trays: See Section 260536.

C. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
   1. Belden: www.belden.com/#sle.
   2. CommScope: www.commscope.com/#sle.
   3. General Cable Technologies Corporation: www.generalcable.com/#sle.
   4. Siemon Company: www.siemon.com/#sle.

B. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568.2 Category 5e UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

C. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6A UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:
   1. Belden: www.belden.com/#sle.
   2. CommScope: www.commscope.com/#sle.
   3. General Cable Technologies Corporation: www.generalcable.com/#sle.
   4. Siemon Company: www.siemon.com/#sle.

B. Fiber Optic Backbone Cable:
   1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
   2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
   3. Cable Capacity: Quantity of fibers as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.

C. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Fiber Optic Cross-Connection Equipment:
   1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
      a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
      b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
      c. Provide incoming cable strain relief and routing guides on back of panel.
      d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
      e. Provide dust covers for unused adapters.

B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
   1. Do not paint over UL label.

C. Equipment Frames, Racks and Cabinets:
   1. Manufacturers:
      a. AtlasIED: www.atlasied.com/#sle.
      b. Belden: www.belden.com/#sle.
      c. CommScope: www.commscope.com/#sle.
      d. Siemon Company: www.siemon.com/#sle.
   2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
   3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
   4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
   5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
   6. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
   7. Cabinets: Steel construction with corrosion resistant finish.
   8. Locks: Keyed alike.

2.06 COMMUNICATIONS OUTLETS

A. Manufacturers:
   1. Belden: www.belden.com/#sle.
   2. CommScope: www.commscope.com/#sle.
   3. Siemon Company: www.siemon.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Outlet Boxes: Comply with Section 260533.16.
   1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

C. Wall Plates:
   1. Comply with system design standards and UL 514C.
   2. Accepts modular jacks/inserts.
   3. Capacity:

a. Data or Combination Voice/Data Outlets: 2 ports.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 260526.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
   4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
      a. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      b. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      c. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
      d. Locate outlet boxes so that wall plate does not span different building finishes.
      e. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches (3000 mm).
   2. At Outlets - Copper: 12 inches (305 mm).
   3. At Outlets - Optical Fiber: 39 inches (1000 mm).

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.

3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
   1. Install to plywood backboards only, unless otherwise indicated.
   2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test backbone cables after termination but before cross-connection.
   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
   3. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.

E. Testing - Fiber Optic Cabling:

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 281000
ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system requirements.

B. Access control units and software.

C. Access control point peripherals, including readers and keypads.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Electrically operated door hardware, for interface with access control system.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
3. Coordinate the work with other installers to provide power for equipment at required locations.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

1.06 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. The requirements of the local authorities having jurisdiction.
3. Applicable TIA/EIA standards.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 ACCESS CONTROL SYSTEM REQUIREMENTS

A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Battery Backup: Provide batteries/uninterruptible power supplies (UPS) as required for 90 minutes full operation.

C. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with access control system.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.
   1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.02 ACCESS CONTROL UNITS AND SOFTWARE

A. Provide access control units and software compatible with readers to be connected.

B. Unless otherwise indicated, provide software and licenses required for fully operational system.

2.03 ACCESS CONTROL POINT PERIPHERALS

A. Provide devices compatible with control units and software.

B. Provide devices suitable for operation under the service conditions at the installed location.

C. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 087100.

2.04 ACCESSORIES

A. Provide components as indicated or as required for connection of access control system to devices and other systems indicated.

B. Unless otherwise indicated, credentials to be provided by Contractor.
   1. Provide credentials compatible with readers and control units/software to be used.

C. Provide cables as indicated or as required for connections between system components.

D. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide grounding and bonding in accordance with Section 260526.

D. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Program system parameters according to requirements of Owner.

D. Test for proper interface with other systems.

E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 282000
VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 303 - Standard for Installing Closed-Circuit Television (CCTV) Systems; 2025.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

1.06 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. Applicable TIA/EIA standards.

PART 2 PRODUCTS

2.01 VIDEO SURVEILLANCE SYSTEM

A. Provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.02 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
   1. Signal-to-Noise Ratio: Not less than 50 dB.
   2. Provide the following standard features:
      a. Automatic electronic shutter.
      b. Automatic gain control.
      c. Automatic white balance.
      d. Web-based interface for remote viewing and setup.
      e. Password protected security access.

2.03 ACCESSORIES

A. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation.

B. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

C. Provide components as indicated or as required for system power and network connections.

D. Provide cables as indicated or as required for connections between system components.

E. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 260529.

D. Provide grounding and bonding in accordance with Section 260526.

E. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

D. Program system parameters according to requirements of Owner.

E. Test for proper interface with other systems.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 283111
BUILDING INTRUSION DETECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Intrusion detection system requirements.

B. Alarm control units and accessory equipment.

C. Initiating devices.

D. Alarm notification appliances.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 087100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and controlled by intrusion detection system.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 281000 - Access Control: For interface with intrusion detection system.

G. Section 282000 - Video Surveillance: For interface with intrusion detection system.

H. Section 284600 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 609 - Local Burglar Alarm Units and Systems; Current Edition, Including All Revisions.

D. UL 634 - Connectors and Switches for Use with Burglar-Alarm Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of devices for the installed locations with work provided under other sections or by others.
2. Coordinate the placement of sensors and keypads with millwork, furniture, equipment, etc. installed under other sections or by others.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install sensors and keypads until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

PART 2 PRODUCTS

2.01 INTRUSION DETECTION SYSTEM REQUIREMENTS

A. Provide new intrusion detection system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Alarm Control Unit: New addressable alarm control panel located as indicated.

C. Initiating Device Requirements:
   1. Protected Premises: Entire building as indicated.
   2. Provide magnetic contacts to monitor opened/closed position for:
      a. Designated perimeter doors and windows.

D. Alarm Notification and Reporting Requirements:
   1. Activate alarm notification at alarm control unit and associated keypads/annunciators with appropriate zone information displayed.
   2. Activate local notification appliances.

E. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with intrusion detection system.
   2. Interface with access control system as specified in Section 281000.
      a. Capable of affecting access for designated doors for selected intrusion detection system events.
   3. Interface with video surveillance system as specified in Section 282000.

F. Provide products listed, classified, and labeled as suitable for the purpose intended.
   1. Local Alarm Units and Systems: Listed and labeled as complying with UL 609.

G. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.02 ALARM CONTROL UNITS AND ACCESSORY EQUIPMENT

A. Manufacturers:
   1. Bosch Security Systems, LLC; _____: www.boschsecurity.us/#sle.
   2. Digital Security Controls (DSC); a brand of Tyco International; _____: www.dsc.com/#sle.
   3. Honeywell International, Inc; Honeywell Security: www.buildings.honeywell.com/#sle.
   4. NAPCO Security Technologies, Inc: www.napcosecurity.com/#sle.
   5. Resideo Technologies, Inc; _____: www.resideo.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Alarm Control Panel: Modular construction.
   1. Enclosure: Lockable; provide tamper protection.
   2. Power Supply:
      a. Primary Power: 120 VAC; provide suitable transformer/power supply; supervised for loss of AC power.
      b. Secondary Power: Standby battery; provide suitable capacity for minimum standby time required by listing requirements, applicable codes, and authority having jurisdiction, but not less than four hours; provide suitable battery charger; supervised for low battery condition; protected from accidental reversal of battery leads.

C. Alarm Initiating Circuits: Supervised.
   1. Hardwired Zones: Supports both normally closed and normally open conventional (non-addressable) initiating devices.
   2. Addressable Zones: Supports addressable initiating devices and modules using multiplexed polling loops.

D. Alarm Notification Circuits: Supervised.

E. Communications Interfaces: Supervised.
   1. Supports system reporting to central station receivers via integral interface or accessory interface modules using:
      a. Telephone lines.
      b. Internet/intranet (IP addressing).

F. Keypads: Supervised.
   1. Provide interface to alarm control unit for system control and remote annunciation.
   2. Provide visual notification of system status and zone information.
   3. Provide audible notification to indicate system status, entry/exit delay, and alarm situations; provide separate distinguishable sounds for alarm and trouble conditions.
   4. Keypad Type: Only LCD or graphic touch screen keypads are acceptable. Do not use LED keypads.
      a. Graphic Touch Screen Keypads: Displays system status and zone information using plain English on graphic display; touch screen interface.
      b. LCD Keypads: Displays system status and zone information using plain English on alphanumeric display; illuminated keys.

G. Peripheral Devices: Supervised; provide tamper protection.

H. Output Relays:
   1. Relay Modules: Form C relays (normally open and normally closed); provide tamper protection.
   2. Programmable to respond to system events, according to defined scheduling, or by manual activation from keypad.

I. User Codes:
   1. Each user code to be individually assignable to any defined authority level for configurable access to system features and functions.

J. Scheduling:
   1. Provide time/calendar-based scheduling capability for automated system control.
   2. Supports open/close schedules for control of arming/disarming and reporting.
   3. Supports timed events including, but not limited to:
      a. Point bypass/unbypass.
      b. Relay activate/deactivate.

K. Event Log:
   1. Stores system events including time, date, partition, zone, and user code where applicable.
   2. Supports viewing of event log on keypads.

2.03 INITIATING DEVICES

A. Manufacturers: Same as manufacturer of alarm control units where possible.

B. General Requirements:
   1. Provide devices suitable for intended application and location to be installed.
   2. Outdoor Units: Weather resistant, suitable for outdoor use.
   3. Addressable Systems:
      a. Addressable Devices: Individually identifiable by control unit.
      b. Provide suitable addressable modules for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

C. Contacts:
   1. Listed and labeled as complying with UL 634.
   2. Magnetic Contacts: Encapsulated reed switch(es) and separate magnet; designed to monitor opened/closed position of doors or windows.

a. Use standard security contacts (not balanced magnetic type) unless otherwise indicated.

2.04 ALARM NOTIFICATION APPLIANCES

A. Manufacturers: Same as manufacturer of alarm control units where possible.

B. Provide alarm notification appliances suitable for connection to control unit outputs.

C. Outdoor Units: Weather resistant, suitable for outdoor use.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of alarm control unit to devices and other systems indicated.

B. Provide cables as indicated or as required for connections between system components.

C. Provide end-of-line resistors (EOLR) as required for supervision of hardwired zones.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide grounding and bonding in accordance with Section 260526.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

E. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Inspection and testing to include, at a minimum:
   1. Test each initiating device for proper response by alarm control unit.
   2. Test for proper operation of alarm notification appliances.
   3. Test for proper operation of output relays.
   4. Test for proper interface with other systems.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 ADJUSTING

A. Program system parameters according to requirements of Owner.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.07 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.08 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 284600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system and associated components, including control units, related equipment, initiating devices, and notification appliances.

1.02 RELATED REQUIREMENTS

A. Section 213000 - Fire Pumps: For interface with fire alarm system.

B. Section 260533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 90 - Standard for Commissioning Building Electrical Systems; 2015.

F. NECA 305 - Standard for Fire Alarm System Job Practices; 2018.

G. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems; 2024.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

K. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment.
   2. Coordinate placement of devices and notification appliances with potential conflicts or view obstructions.
   3. Coordinate work to provide power for equipment at required locations (e.g., smoke dampers, type of actuators, line or local control transformer, zoning, grouping and circuit activations).
   4. Coordinate fire suppression systemdevice requirements, monitoring, control, and associated interconnections.
   5. Coordinate requirements for branch circuit protection, identification, and shunt trip if applicable.
   6. Coordinate kitchen equipment requirements for fire alarm system interconnections based on selected equipment.
   7. Coordinate reflected ceiling plans to avoid conflicting placements; maintain minimum diffuser and detector clearances as indicated.
   8. Coordinate submittals to confirm equipment and associated components are capable of indicated settings, and manufacturer documentation identifies required compatible product listings.

9. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
10. Elevators or Escalators: See Division 14.
11. Lighting Controls: See Division 26.

B. Preinstallation Meetings:
1. Conduct meeting with facility representative to review devices, notification appliances, and equipment locations.
2. Conduct meeting with facility representative and other related equipment manufacturers to discuss fire alarm system interface requirements.
3. Conduct meeting to review anticipated installation of code-required smoke control requirements, product solutions, and SOO.
4. Convene one week before starting work for review of documented SOO for system applications.

C. Sequencing:
1. Verify exact termination locations required for boxes, enclosures, and equipment.
2. Do not install devices or notification appliances until final surface finishes, painting, and cleaning are complete, unless otherwise required by AHJ.
3. Do not begin installation of conductors and cables until installation of conduit and pathways between termination points is complete.
4. Sequence work to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).
5. Verify naming convention for equipment identification, including room names and numbers, prior to creation of final drawings, reports, and labels.

D. Scheduling:
1. Arrange access to facility for data collection with facility representative.
2. Where work involves interruption of existing electrical or fire alarm system service, arrange interruption with Owner.
a. Arrange test start and end with responsible reporting service. Confirm system normal operating mode and record as-found and as-left settings.
b. Arrange work to disable individual devices or circuits for minimal disruption if possible.
c. Arrange in accordance with NFPA 72 fire alarm system impairment requirements.
d. Where required by AHJ, arrange systems or partial system out of service interruption in accordance with requirements of building, life safety, and fire codes (e.g., approved fire watch plus required notifications, tags at each fire department connection and control valve, and AHJ notification when excess hours).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Evidence of designer qualifications.

C. Comply with NFPA 72 chapter "Documentation," including noting names of installers, owners, and system classification information.

D. Design Documents: Submit all information required for plan review and permitting by AHJ, including floor plans, riser diagrams, and description of operation.
1. Copy (if any) of list of data required by AHJ.
2. NFPA 72 "Record of Completion", filled out to extent known at time.
3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A, and complete listing of software required.
4. Manufacturer's detailed product data sheet for each component, including wiring diagrams, and circuit length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.

5. Certification by manufacturer of FACU that system design complies with Contract Documents.
6. Certification by Contractor that system design complies with Contract Documents.

E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.
1. System zone boundaries and interfaces to fire safety systems.
2. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.
3. Include elevations and details of proposed equipment arrangements.
4. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.
5. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.
6. Include requirements and control diagrams for interfacing with other systems.
7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.
8. List of devices and notification appliances on each SLC, with spare capacity indicated.
9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
11. Detailed drawing of graphic annunciators, displays, and interfaces.
12. Certification by either FACU manufacturer or manufacturer of related equipment.
13. Certification by FACU manufacturer that system design complies with Contract Documents.
14. Certification by Contractor that system design complies with Contract Documents.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Evidence of installer qualifications.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test," filled out.

J. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by AHJ.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.

8. Detailed but easy to read explanation of procedures require recording of system trouble events by qualified personnel, such as when routine testing is being conducted for fire drills and when entering into contracts for building renovations.

K. Project Record Documents: See Section 01 7800 for additional requirements, have one set available during closeout demonstration:
   1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
   2. "As installed" wiring and schematic diagrams, with final terminal identifications.
   3. "As programmed" operating sequences, including control events by device, and updated input/output chart.

L. Closeout Documents:
   1. Certification by manufacturer that system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
   2. NFPA 72 "Record of Completion," filled out completely and signed by installer and authorized representative of AHJ.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III (three) or Level IV (four) certified fire alarm technician or registered fire protection engineer, employed by FACU manufacturer, Contractor, or installer, with experience designing fire alarm systems in jurisdictional area of AHJ.

B. Installer Qualifications: Firm with minimum three years documented experience installing fire alarm systems of specified type and providing contract maintenance service as regular part of their business.
   1. Authorized representative of FACU manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least two years of experience installing fire alarm systems.
   3. Supervisor: Level III (three) or Level IV (four) certified fire alarm technician; furnish name and address.

C. Manufacturer Qualifications: Company specialized in manufacturing products specified in this section with at least three years of documented experience.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 305.

C. Handle carefully to avoid damage to internal components, enclosure, and finish.

D. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

B. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

C. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (minus 10 degrees C), unless otherwise permitted by manufacturer's

instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. General Requirements:
   1. Provide new fire alarm system complying with NFPA 70, NFPA 72, NFPA 90A, and consisting of required equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as necessary for complete operating system that provides functional intent indicated.
   2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. 36 CFR 1191 and ADA Standards.
      b. Requirements of AHJ.
      c. Applicable local codes.
      d. Contract Documents.
      e. NFPA 72; "should" is mandatory; where conflicts between requirements require deviation, identify deviations clearly on design documents.
   3. Fire Alarm System Products:
      a. Listed, classified, and labeled as suitable for purpose intended.
      b. Installation Environments: Provide products suitable for their respective indoor and outdoor applications.
   4. Fire Alarm System Design Information:
      a. Building Code: Comply with applicable building code.
         1) Principle Occupancy: As indicated on Architect code summary drawings.
         2) Principle Use: As indicated on Architect code summary drawings.
         3) Elevators: As indicated on Architect code summary drawings.
         4) Occupant Evacuation Method: Total building.
         5) Fire Suppression System: Fully sprinkled.
            (a) Types:
      b. NFPA 72 Fire Alarm System Classification: Protected premises.
      c. Smoke and Heat Detector Coverage: Partial or selective coverage in accordance with NFPA 72.
   5. Provide fire alarm circuits in accordance with NFPA 70.
      a. Comply with methods of interconnecting FACUs in accordance with NFPA 72 and NFPA 70.
      b. Power Sources:
         1) Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.
         2) Primary: Dedicated branch circuits from facility power distribution system.
         3) Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.
      c. Wiring and Wiring Methods:
         1) General Requirements:
            (a) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.
            (b) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed and labeled as suitable for use in return air plenums.
            (c) Special Occupancies: Comply with NFPA 70.
            (d) Comply with NFPA 70 for wire and cable plenum, riser, general-purpose, limited-use, undercarpet, and underground applications.
         2) Fire Alarm Circuits:

(a) Comply with NFPA 70 for conditions and types required for multiconductor cable systems.
(b) Non-Power-Limited Fire Alarm (NPLFA) Circuits:
(1) Provide dedicated NPLFA non-GFCI branch circuits for fire alarm equipment and marked by red identification in accordance with NFPA 70.
(c) Power-Limited Fire Alarm (PLFA) Circuits:
(1) Provide identification for PLFA circuits in accordance with NFPA 70.

6. Provide pathway class designations and pathway survivability, as defined in NFPA 72.
   a. Provide monitoring of conductors and other signaling channels for integrity and circuit performance.
   b. Pathway Class Designations:
      1) Unless otherwise indicated or required, pathways to meet the following requirements:
         (a) SLCs: Class B (star, tee-tap, multi-tap, with no return).
         (b) IDCs: Class B (daisy-chain with EoL resistor device installed at end of circuit).
         (c) NACs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

B. Fire Alarm System Interfaces and Control Functions:
1. UL 864 listed unless otherwise indicated.
2. Descriptions below are intended to provide means for interface. See project SOOs, narrative, and input/output matrix for execution requirements.
3. Provide initiating devices, interfaces, and control functions for emergency control function interfaces in accordance with NFPA 72.
4. Provide monitoring of interconnected systems. Coordinate notification appliance alternate markings as indicated on drawings.
5. Fire Suppression Systems:
   a. Provide minimum of four monitoring point inputs per system unless otherwise indicated.
   b. Kitchen Hood Suppression Systems: Provide minimum of one monitoring point input per system.
6. Elevators:
   a. Comply with ASME A17.1.
   b. Elevator Shutoff:
      1) Elevator Machine Room Heat Detector:
         (a) Shut down elevator power prior to hoistway sprinkler activation.
         (b) Locate within 24 inches (610 mm) of each sprinkler in accordance with NFPA 72.
      2) Sprinkler Pressure or Waterflow: Shut down elevator power prior to hoistway sprinkler activation.
      3) For each elevator, provide output signal to stop elevator via addressable relay module and power isolation relay.
   c. Elevator Emergency Recall Operation:
      1) Elevator Lobby, Hoistway, and Machine Room Smoke Detectors: Elevator recall for fire fighters' service.
      2) In each elevator machine room, provide interface for each elevator car or group of elevator cars as determined by AHJ via separate addressable relay modules for each output signal below, where applicable.
         (a) Recall elevator to designated (primary) level.
         (b) Recall elevator to alternate level.
         (c) Smoke detection in elevator machine room (fire fighter's hat light).
7. Fire and Smoke Doors/Shutters/Curtains:

8. HVAC Systems:
    a. Air Handling Units (AHUs) and Roof Top Units (RTUs):
        1) Provide duct smoke detector on supply side of air stream for units over 2,000 cfm.
        2) Provide duct smoke detector on return side of air stream for units over 15,000 cfm.
        3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.
        4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.
        5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that mounting surfaces are ready to accept components and equipment, with suitable support frames and anchors installed where required.

B. Verify ratings, configurations, and characteristics of system components.

C. Verify rough-ins for field connections.

D. Verify that work likely to damage fire alarm system has been completed.

E. Verify that interior of building has been protected from weather.

F. Perform preinstallation tests and inspections per manufacturer's instructions and in accordance with NECA 305.

G. Verify that system bonding is in accordance with Section 260526.

H. Do not energize system until deficiencies have been corrected.

I. Verify that branch circuit wiring installation is completed, tested, and ready for connection to fire alarm system. Overcurrent protection ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

3.02 PREPARATION

A. Prior to installation, confirm environment of installation area is clean, and with ambient temperature, humidity, and ventilation requirements are per manufacturer’s written instructions.
    1. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for air flow.
    2. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.
    3. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.
    4. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.

C. Remove detector dust covers prior to system energization.

3.03 INSTALLATION

A. Install field-devices, components, FACU and related equipment, and accessories in accordance with the following:

B. Field Locations:
    1. Obtain Owner's approval of locations of devices and notification appliances before installation.

2. Arrange equipment to provide minimum operational clearances and required maintenance access in accordance with manufacturer's instructions and NFPA 70.
3. Conceal wiring, conduit, outlet boxes, and supports where installed in finished areas; maintain code-required access.

C. Raceways and Supports:
1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.
2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.
3. Install firestopping to preserve fire resistance rating of partitions and other elements.

D. Wiring and Connections:
1. Maintain separation of Class 1, Class 2, Class 3 remote-control, signaling, fire alarm circuits, and power-limited circuits in accordance with cable insulation class and NFPA 70.
2. Maintain circuit pathway and class designations in accordance with NFPA 72 for configuration, separation, and survivability.
3. Comply with permitted and not permitted installations for wires, cables, cable routing assemblies, communications circuits, and fire alarm circuits in accordance with NFPA 70.
4. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by AHJ. Provide independent support from building structure and suspended ceiling systems. Do not provide support from raceways, piping, ductwork, or other systems.
5. Provide grounding and bonding in accordance with Section 260526.
6. Comply with manufacturer's minimum cable sizes or ratings.
7. Do not exceed manufacturer's recommended maximum power, signal, or network cable lengths between components.
8. Provide network wiring in accordance with NFPA 70.
9. Neatly train and bundle conductors inside boxes, wireways, and cabinets.
10. See manufacturer's instructions for batteries.

E. Fire Alarm System Components:
1. Install field-installed devices, components, relays, notification appliances, accessories, and when applicable EoL resistors.
    a. Install wiring to supervisory devices and associated EoL resistors as required for supervision of hardwired connections
2. Install Wall-Mounted Equipment: Assemble component hardware within (e.g., card bays, sub-bays, expansion bays, signal cards, other card frames, networking, signal transmission, application modules, tamper monitoring devices, interconnecting modules, and auxiliary power supplies), including space for required spare capacity, and configure settings.
3. Install Interconnect Wiring: Connect system cabinets, install processor and cards, cabling, connectors, terminations, and bonding.

F. Branch Power:
1. After installation confirmations, follow manufacturer instructions to connect branch circuit power cables to premises fire alarm system components; comply with NFPA 70.
2. Where accessories require auxiliary power, provide control power source and monitoring as indicated or as required to complete installation.
3. Install auxiliary power supplies, including indicated monitoring, and connections necessary for remote equipment.

G. System Identification:
1. Identify devices, notification appliances, components, cables, and equipment in accordance with approved submittals. See Section 260553.
2. Confirm fire alarm system programming meets requirements of SOO and sub-system SOOs.

3. Mark location of disconnecting means for NPFLA circuits.
4. Coordinate to provide red branch power circuit protective devices or identify them accordingly as required by NFPA 72 and NFPA 70.
5. Mark date of batteries installed on inside cover of panels and formal maintenance logs.

H. Troubleshooting and Installer Checks:
1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.
2. Check system operation for notification, FACU functions, circuit supervision, alarm initiating devices, supervisory initiating devices, dress panels/doors/covers, and programming before performing field tests.

I. Fire Alarm System Tests:
1. Perform required tests of NFPA 72. Record measured values during operational checks.
2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide services of manufacturer's authorized representation to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's detailed testing procedures and field reports and with submittals.

C. Provide equipment, two-way radios for testing personnel use, tools, and supplies required to accomplish inspection and testing.

D. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

E. Inspect and test in accordance with manufacturer's instructions.

F. Inspect wiring and components for damage and defects.

G. Batteries and Power Supplies: Perform inspections and tests listed in manufacturer installation instructions.

H. Perform additional requirements related to testing and inspection during system startup.

I. Test for interface with other systems.

J. Test shunt trips to verify operation.

K. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicated inspection and testing results, corrective actions taken, and as-found and final adjusted settings.

3.05 SYSTEM STARTUP

A. Obtain Owner approval prior to performing system startup.

3.06 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust initiating device and notification appliance settings to achieve desired operation as indicated in submittals.

C. Measure power supply primary and secondary voltages, log values for records, and make appropriate adjustments.

D. Adjust alignment of equipment covers and doors. Provide keys and spare keys to Owner.

E. Reprint and reinstall damaged or misinstalled labels; maintain neat and square to installed location good workmanship - see NECA 1; maintain consistent placements for identification on products of similar type.

F. Adjust devices or notification appliances and associated bases to be flush and level.

G. Program system parameters according to requirements of Owner.

3.07 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. See Section 017419 - Construction Waste Management and Disposal for field-generated construction waste requirements.

C. Check tightness of electrical connections. Replace damaged components and provide closure plates for vacant positions. Provide circuit directory updates for related power branch circuits.

D. Clean and repair existing materials and equipment that remain or are indicated for reuse.

E. Clean dirt, debris, plaster, and other foreign materials from outlet boxes and fire alarm system equipment and components.

F. Clean fire alarm system equipment and components according to manufacturer's instructions and NECA 305.

G. Clean surfaces and interiors of boxes and device cover plates in accordance with manufacturer's instructions to remove dirt, fingerprints, debris, plaster, and other foreign materials.

H. Repair scratched or marred exposed surfaces to match original factory finish.

I. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked 'nonspillable.'

3.08 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Comply with NFPA 3 for commissioning of fire protection and life safety systems.

C. Comply with NECA 90 for commissioning building electrical systems.

D. Support Commissioning Agent in assembling test data and generating reports.

E. Participate in four hours of seasonal testing, as scheduled by Commissioning Agent, six months from Date of Substantial Completion.

3.09 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.

E. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.

G. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

3.10 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Closeout Demonstration: Demonstrate operation of all functions to Owner.
   1. Be prepared to conduct any of required tests.

2. Have minimum one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of FACU manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.
5. Repeat demonstration until successful.

3.11 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond control of maintenance contractor.
3. Record keeping required by NFPA 72 and AHJ.

C. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within two hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.

E. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 31 1100
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Clearing and grubbing site and street right-of-way.

B. Disposing of removed material

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

1.03 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 NO PRODUCTS INCLUDED

PART 3 EXECUTION

3.01 SITE PREPARATION & PROTECTION

A. Protection of Existing Improvements.
   1. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
   2. Protect improvements on adjoining properties.
   3. Restore damaged improvements to their original condition, as acceptable to Architect/Engineer or other parties having jurisdiction.

B. Protection of Existing Trees and Vegetation:
   1. Protect existing trees and other vegetation, indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bank, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
   2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
   3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in manner acceptable to the Architect/Engineer. Employ qualified tree surgeon/arborist to repair damage to trees and shrubs.

3.02 SITE CLEARING

A. General: clear construction areas of trees, vegetation, improvements, debris, or other obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Tree removals include the removal of root balls and roots.

B. Removal of Improvements: Remove above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

C. Abandonment or removal of certain underground pipe or conduits may be shown on mechanical or electrical drawings, and is included under work of this section. Removal of all other abandoned underground piping or conduit interfering with construction is included under this section.

3.03 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted on Owner’s property.

B. Remove cleared waste materials from Owner’s property and dispose of at an off site location secured by the contractor.

END OF SECTION

SECTION 31 2000
EARTH MOVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Stripping and stockpiling surface layer of topsoil and organic matter in building and traffic areas and in all cut and fill areas.

B. Removing and disposing of material unsuitable for use in controlled fill.

C. Excavating site to required subgrade for controlled fill and grading site to required slopes.

D. Placing and compacting excavated material and borrow material to required density and at required subgrade and slope for structures, pavement areas, and other controlled fills.

1.02 RELATED WORK

A. Section 31 2216 – Fine Grading.

B. Section 33 0516 – Manholes and Structure.

1.03 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

C. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

D. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

E. ASTM D422 – Particle Size Analysis of Soils.

F. ASTM D2216 – Method of Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

G. ASTM D3017 – Moisture Content on Soil Aggregates in Place by Nuclear Methods (Shallow Depth).

H. ASTM D2922 – Density of Soil and Soil Aggregates in Place by Nuclear Method (Shallow Depth).

1.04 SUBMITTALS

A. See Related Work

1.05 SITE CONDITIONS

A. Establish positive surface drainage during and following clearing and grading activities using proper ditching and sloping methods.

B. Provide erosion control measures to prevent mud and slit from flowing onto adjacent property.

C. Erect sheeting, shoring, and bracing as necessary for protection of persons, utilities improvements, and excavations.

PART 2 PRODUCTS

2.01 SUITABLE MATERAILS FOR CONTROLLED FILL

A. On site excavated soils:
   1. Unified Soils Classification Systems Soils.
      a. Class SC
      b. Class GC
      c. Class CL
   2. Soils having Liquid Limit of less than 45, Plasticity Index (PI) of 20 or less.

3. Other soils approved by the Engineer.

B. Borrow Material:
   1. Soils meeting the requirements of sub-paragraph A.1 of this Article.

C. Material meeting the requirements of selected material as described in Section 210 of the Arkansas State Highway Department's Standards Specifications for Highway Construction, Edition of 2003.

2.02 UNSUITABLE MATERIAL FOR CONTROLLED FILL

A. All areas: Organic top soils, soils containing roots, vegetable matter, or trash, and silts (ML) and clays (CH), and cobbles and fractured rock more than 3 inches in greatest dimension.

PART 3 EXECUTION

3.01 SUBSURFACE INVESTIGATION

A. The Contractor is responsible for having a thorough knowledge of all Drawings, Specifications, General and Supplementary Conditions, existing site conditions, and other Contract Documents. Failure to acquaint himself with this knowledge does not relieve him of the responsibility for performing his work in a manner acceptable to the Owner. No additional compensation will be allowed because of conditions that occur due to failure by the Contractor to familiarize himself and all workers with this knowledge.

B. Protection of Existing Trees and Vegetation:
   1. Protect existing trees and other vegetation, indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bank, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
   2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
   3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in manner acceptable to the Architect/Engineer. Employ qualified tree surgeon to repair damage to trees and shrubs.

3.02 PREPARATION

A. Complete clearing work, removing visible unsuitable materials from site.

B. Protect benchmarks, site corner pins and existing street paving from damage by equipment.

C. Stake the work:

D. Before starting the excavation, establish location and extent of underground utilities occurring in work area.

E. Notify utility companies of lines which are in the way of excavation.

F. Protect existing utility lines to remain which pass through the work area.

G. Protect utility services uncovered by excavation.

H. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

I. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

3.03 EXCAVATION PROCEDURES

A. Excavation General:
   1. Strip topsoil in cut and fill areas to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove and dispose of heavy growth of grass and surface debris from areas prior to stripping topsoil.

a. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.

2. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.
3. Remove soft or spongy material at the exposed sub-grade of cut and fill areas and replace with approved material and compact.
4. Use all suitable excavated material, as far as practicable, in the formation of controlled fills and fill slopes.
5. Keep all excavations dry by pumping or draining water from the Work.
6. In cut areas where fill is not required proof roll the areas with a loaded tandem axle dump truck or similar equipment to aid in identifying soft areas. Remove soft soils and replace with controlled fill. Scarify exposed sub-grade soils to a depth of at least 8 inches, adjust the soil mixture, and recompact to the same density as required for each layer of controlled fill.
7. Grade excavated slopes to a neat, smooth condition with no loose material or scars left on the surface.
8. Dispose of debris, excess topsoil, excess fill material and unsuitable material at an off site location secured by the contractor.

3.04 CONTROLLED FILL

A. After excavation and before fill placement, proof roll fill areas with a loaded tandem axle dump truck or similar equipment to aid in identifying soft areas. Remove soft areas and replace with controlled fill.

B. Scarify cleared surface in fill areas to a depth of at least 8 inches, adjust the soil mixture, and recompact to the same density as required for each layer of controlled fill.

C. Place fill material in lifts no greater than 8-inch loose-lift uniform thickness and compact to 95% MAX Dry Density as determined by the Modified Proctor Test, ASTM D1557.
   1. Aerate material when too wet by manipulation with suitable equipment before compacting.
   2. Add water when soil is too dry and mix with the material before compacting.

D. Complete excavation and controlled fill elevations to match finish grade, less the depth of topsoil specified for sodded and seeded areas in the landscape plan.

3.05 FIELD QUALITY CONTROL

A. Field density tests will be performed per ASTM D6938.

B. Frequency of Tests:
   1. Tests shall be made every day fill is being placed and representative lifts tested.
   2. At least one test per 2,500 sq. ft. under buildings and structural areas.
   3. At least one test per 5,000 sq. ft. under paved areas.
   4. At least one test per 10,000 sq. ft. in general areas.
   5. Contractor to notify engineer when fill work is in progress.
   6. Test locations will be selected at random by engineer with an effort made to select areas of questionable compaction.
   7. Retesting required because of nonconformance to specified requirements shall be performed by the same agency on instruction from the engineer.
   8. Retesting required because of nonconformance to specified requirements shall be paid for by the contractor. Payment for retesting or re-inspection will be charged to the contractor by deducting testing charges from the contact sum/price.

END OF SECTION

SECTION 31 2216
FINE GRADING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

1.02 WORK INCLUDED

A. Stripping and stockpiling surface layer of topsoil and organic matter in all cut and fill areas.

B. Excavating and grading open drainage ditches.

C. Placing and compacting excavated material or borrow material to required density and at required subgrade and slope for roadway embankment and other compacted fills.

D. Removing and disposing of excess excavated material.

1.03 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 33 0516 – Manholes and Structure.

1.04 SUBMITTALS

A. See Related Work

1.05 SITE CONDITIONS

A. Establish positive surface drainage during and following stripping, embankment construction, and roadway grading by proper ditching or slopping.

B. Provide measures to prevent mud and silt from flowing onto adjacent property.

C. Erect sheeting, shoring, and branching as necessary for protection of persons, improvements, and excavations.

PART 2 PRODUCTS

2.01 SUITABLE MATERIAL FOR COMPACTED EMBANKMENT

A. On site excavated soils:
   1. Unified Soils Classification Systems Soils.
      a. Class SC
      b. Class GC
      c. Class CL
   2. Soils having Liquid Limit of less than 45, Plasticity Index (PI) of 20 or less.
   3. Other soils approved by the Engineer.

B. Borrow Material:
   1. Soils meeting the requirements of sub-paragraph A.1 of this Article.

C. Material meeting the requirements of selected material as described in Section 210 of the Arkansas State Highway Department’s Standards Specifications for Highway Construction, Edition of 2014.

2.02 UNSUITABLE MATERIAL FOR COMPACTED EMBANKMENT

A. All areas: Organic topsoil’s, soils containing roots, vegetable matter, or trash, and cobbles and fractured rock more than 3 inches in greatest dimension.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove visible unsuitable materials from the site before beginning stripping and site grading operation.

B. Notify Architect/Engineer when work is ready to be staked.

C. Notify the geotechnical engineer representing the Owner's selected testing laboratory at least 48 hours before planned time to begin placing embankment material.

3.02 EXCAVATION PROCEDURES

A. Excavation, General:
   1. Strip topsoil in cut and fill areas to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove and dispose of heavy growth of grass and surface debris from areas prior to stripping topsoil.
   2. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
   3. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.
   4. Remove soft or spongy material at the exposed sub-grade of cut and fill areas and replace with approved material and compact.
   5. Use all suitable excavated material, as far as practicable, in the formation of controlled fills and fill slopes.
   6. Keep all excavations dry by pumping or draining water from the work site.
   7. Grade excavated slopes to a neat, smooth condition with no loose material or scars left on the surface.
   8. Protect existing asphalt paving and structures designed to remain from drainage by excavation and grading operations.
   9. Dispose of debris, excess topsoil, excess fill material and unsuitable material at an off-site location secured by the contractor.

B. Excavation, roadway:
   1. Excavate and grade to within ±0.1 foot of required subgrade elevations.
   2. Grade back slopes to the slope shown on the Drawings.
   3. Remove soft or spongy material at the exposed subgrade of cut and fill areas and replace with select material and compact to the same density as required for compacted fill. Identify soft areas by proof rolling with a loaded tandem axle dump truck or similar equipment.
   4. DO not allow subsoil in roadbed area to become saturated. Maintain positive surface drainage during and following excavation, grading, and filling operations.
   5. Where compacted fill is required, scarify stripped surface to a depth of at least 8 inches, adjust the soil moisture, and recompact to the same density as required for each layer of compacted fill.

3.03 COMPACTED EMBANKMENT

A. Start embankment full width of bottom of embankment cross-section and construct to specified grade over full width in uniform layers.

B. Place fill material in lifts no greater than 8 inch loose-lift uniform thickness and compact to a minimum of 95% of maximum dry density at or near optimum moisture content as determined by the Modified Compaction Procedures, ASTM D1557.
   1. Add Water when soil is too dry and mix the material before compacting.
   2. Aerate material when too wet by manipulation with suitable equipment before compacting.

C. Do not place next lift until the in-place density and moisture content of the preceding lift has been verified.

D. Geotechnical engineer will inspect and test soil for suitability for use in embankment and for need to perform additional "Proctors" as soil composition changes during progress of excavation. Do not compact layer of soil that geotechnical engineer has determined to be a "change in soil composition" until it has been determined to be suitable and a "Proctor" has been run.

E. Coordinate with the geotechnical engineer and provide the necessary assistance to perform the tests. Initial soil testing costs shall be paid for as outlined in the testing specification of the front-end documents. Should the tests be unsatisfactory, the Contractor shall be responsible for obtaining and paying for additional tests, which will be performed by an independent laboratory approved by Owner and Engineer.

F. Maintain stability of compacted embankment. Replace or repair portions which have eroded due to elements or to Contractor negligence.

G. Grade for slopes and other embankment areas not to be paved, to neat, smooth conditions with no loose material or scars left on surface. Fill and grade slopes to within three inches of finish grade elevations to allow for topsoil, sod and other landscaping.

3.04 PROTECTION

A. As soon as embankment is completed, proceed with riprap work and notify architect/Engineer that slopes are ready for erosion protection by landscaping contractor.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavating rock encountered during trenching for utility lines and excavating for manholes by mechanical methods. Blasting is not allowed.

B. Disposing of excavated rock material.

1.02 RELATED WORK

A. Section 33 1100 – Water Utility Distribution Piping.

B. Section 33 3100 – Sanitary Utility Sewerage Piping.

C. Section 33 3900 - Sanitary Utility Sewerage Structures.

D. Section 33 0516 – Manholes and Structures.

1.03 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 MATERIALS

A. Definition of rock: All solid rock formation that, in the opinion of the Engineer, cannot be excavated by using power shovels or other power excavators which are of recognized manufacture and design, of adequate size and operated by qualified operators without continuous and systematic blasting, barring or wedging. It shall include boulders or pieces of detached rock exceeding one cubic yard in volume and solid rock formations which are interspersed with strata of clay or other material provided however that the solid rock constitutes at least 75% of the total volume of the particular formation. The conventional heavy-duty excavating equipment may be defined as a Caterpillar D-6 bulldozer with single tooth ripper, a Caterpillar 325 track excavator equipped with a single tooth ripper and rock teeth, or equipment of similar power and capability. Rock excavation volumes should be determined based on in-place measurements via cross sectioning. If excavation is to be unclassified, the contractor must be responsible for assessing rock excavation requirements.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify site conditions and note irregularities affecting work of this section.

B. Beginning work of this section means acceptance of existing condition.

3.02 ROCK EXCAVATION – GENERAL

A. Excavate rock encountered in excavating for manholes and trenching for water and sewer lines.

B. De-watering: Provide temporary adequate de-watering equipment to keep excavations free of standing water during rock excavation.

3.03 ROCK EXCAVATION – MECHANICAL METHOD

A. Excavate for and remove rock by the mechanical method.

B. Cut away rock at excavation bottom to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for subgrade levels.

D. Remove Excavated Material from Site.

END OF SECTION

SECTION 31 2500
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work shall consist of temporary erosion control measures needed to control erosion and water pollution, through the use of berms, sediments basins, sediments dams, silt fences, silt dikes, and temporary seeding.

B. Temporary erosion control measures shall be performed promptly when problems occur or when potential problems are anticipated in certain areas in order to minimize soil erosion. The temporary erosion control measures shall be properly maintained until permanent erosion control features are functioning properly.

C. The Contractor shall comply with all Federal, State, and Local laws and regulations controlling pollutions of the environments. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds and reservoirs with fuel, oils, bitumens, chemicals, soil sedimentation or other harmful materials and to prevent pollution of the atmosphere from particulate gaseous matter.

1.02 RELATED WORK

A. Section 31 1100 –Clearing and Grubbing

B. Section 31 2000 – Earth Moving

1.03 SUBMITTALS

A. See Related work.

1.04 QUALITY ASSURANCE

A. Prior to start of the construction, the Contractor shall submit, to the Owner and Engineer, his schedule for temporary and permanent erosion control work based on the Engineer's erosion control base plan, as is applicable for clearing & grubbing, grading and trenching. The location of the project, type of soil, topography and proximity to watercourses shall be considered when imposing such limitations.

PART 2 PRODUCTS

2.01 FILTER FABRIC

A. The filter fabric for silt fence shall be as indicated on the drawings.

PART 3 EXECUTION

3.01 PERMITTING

A. The Contractor shall file the Notice of intent to discharge storm water associated with the planned construction activity in accordance with the State of Arkansas NPSES General Permit ARR10A000 48 hours before starting construction. The Contractor shall develop a Storm Water Pollution Prevention Plan (SWPPP) document for submittal to ADEQ.

B. The Contractor shall be responsible for preparing all required permit applications and payment of all permitting fees as may be necessary for this project.

3.02 EROSION CONTROL

A. The Contractor shall schedule and conduct his operations in such a manner as to insure good erosion control practices so as to minimize soil erosion and prevent the contamination of and depositing of sediment in adjacent streams or other water courses, lakes, ponds, and other areas of water impoundment. Temporary erosion control measures which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with clearing & grubbing, grading, and trenching operations.

B. Permanent erosion control devices or measures shall consist of culvert pipe, terraces, gutters, bituminous curb, sectional drains, permanent slope drains, and the establishment of permanent

vegetation (seeding), and when included in the contract they shall be incorporated in the construction with the least delay. Trenched areas shall be seeded as the excavation proceeds to the extent considered necessary by the Engineer as desirable or practicable.

C. The Contractor shall also conform to the following practices and controls:
   1. When the material is trenched, erosion of the slopes shall be controlled both during and after completion of the work, that erosion will be minimized, and sediment will not enter streams, wetlands or other bodies of water. Haul roads shall be located and constructed in a manner that will keep sediment from entering streams.
   2. Pollutants such as fuels, lubricants, bitumens, raw sewage and other harmful materials shall not be discharged into or near rivers, streams or impoundments or into natural or manmade channels leading thereto. Wash water or waste from concrete mixing operation shall not be allowed to enter live streams.
   3. All applicable regulations of agencies and statutes relating to the prevention and abatement of pollution shall be complied within the performance of the contract.
   4. Dust Control:
      a. Implement dust control methods to control dust creation and movement on construction sites and roads and to prevent airborne sediment from reaching receiving streams or storm water conveyance systems, to reduce on-site and off-site damage, to prevent health hazards, and improve traffic safety.
      b. Control blowing dust by suing one or more of the following methods:
         1) Mulches bound with chemical binders.
         2) Temporary vegetative cover.
         3) Spray-on adhesives on mineral soils when not used by traffic.
         4) Tillage to roughen surface and bring clods to surface.
         5) Irrigation by water sprinkling.
         6) Barriers using solid board fences, snow fences, burlap fences, crate walls, bales of hay, or similar material.
      c. Implement dust control methods immediately when dust is observed blowing on Site.

D. All temporary erosion and sediment control structures shall be constructed in accordance with the Storm Water Pollution Prevention Plan. All temporary structures shall be maintained in proper operating condition during the construction period. The temporary structures shall be removed, and the site cleaned up only after the end of the construction activity and the seeding and fertilizing operation has been completed and the grass has been established.

E. The contractor shall follow the general guidelines for placement of erosion and sediment control as indicated on the Erosion Control Plan as part of his SWPPP. The Contractor shall add any required additional erosion and/or sediment control devices as necessary to control erosion and sediment on the project site. The contractor shall use the Engineer’s erosion control plan to comply with the SWPPP and it shall include as a minimum the following items:
   1. Time scheduling for the various phases of the work designed to limit the time between the clearing and the temporary seeding and fertilizing to a reasonable period of time.
   2. Temporary erosion control measures shall be included in the plan in accordance with the temporary erosion control details as included on the Erosion Control Plan.
   3. A time schedule shall be included in the plan detailing when each erosion control structure shown on the plans is to be constructed. Each structure should be constructed as soon as practical after access to the site has been achieved and prior to major grading operations.
   4. Temporary erosion control structures shall be maintained to function satisfactorily and all sediment and debris removed and disposed of in a manner acceptable to the Engineer.

3.03 INSPECTION

A. The Contractor shall appoint a qualified person(s) to conduct regularly scheduled inspections during his contract. Inspections shall be conducted, with a minimum frequency of every seven (7) calendar days or within 24 hours following the end of at least a 0.5-inch 1/2 inch rainfall

event, whichever is earliest. During the inspection, the following areas (as a minimum) will be inspected:

1. Disturbed Areas – All areas of disturbed soil i.e., bare soil with no ground cover shall be inspected for signs of washing and erosion.
2. Material Storage Area – All central storage areas where materials/chemicals are stored for signs of spill, leaks and possible contamination.
3. Erosion and Sediment Control Measures – Inspect all erosion and sediment control measures for signs of wear, damage, remaining capacity level, usefulness, etc.
4. Discharge Locations – Immediately following, and possibly during a significant rainfall event, inspect all discharge locations to ascertain the effectiveness of the control measures.
5. Entrance/Exit Locations –Inspect all exit points from the site for evidence of vehicle tracking.

B. The inspector shall complete an inspection form for each inspection performed. As a minimum, the inspection form shall contain the following information:

1. Name and location of project.
2. Name and title of the inspector.
3. Date and time of the inspection.
4. Condition of each of the above locations.

3.04 MAINTENANCE OF ROADWAYS

A. A. The existing paved roadways adjacent to the permitted entrance locations shall be maintained in a clean and passable condition by the Contractor. When required or as requested by the Owner of the Engineer, the Contractor shall broom or wash the existing paved roadways to remove excess mud or dirt at the intersection and for a reasonable length of the existing roadway beyond the intersection. The work shall not be paid for directly but shall be considered incidental to the other items of work and the cost included as a part of the work.

3.05 PAYMENT

A. Payment for the work in this section shall be included as part of the lump sum contract.

END OF SECTION

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 1947 (Revised 2001).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.

E. Manufacturer's Instructions: Indicate caution requirement.

F. Record and document moisture content of soil before application.

G. Maintenance Data: Indicate re-treatment schedule and ____.

H. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Approved by manufacturer of treatment materials.
   2. Licensed in the State of Arkansas.

1.05 WARRANTY

A. See Section 01 7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

C. Manufacturers:
   1. Bayer Environmental Science Corp; ____: www.backedbybayer.com/pest-management/#sle.
   2. FMC Professional Solutions; ____: www.fmcprosolutions.com/#sle.
   3. Syngenta Professional Products; ____: www.syngentaprofessionalproducts.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

D. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

E. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

F. Re-treat disturbed treated soil with same toxicant as original treatment.

G. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

END OF SECTION

SECTION 32 0523
CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Formwork, complete with required shoring, bracing and anchorage.

B. Control joints and expansion joints.

C. Concrete joints and expansion joints.

D. Cast-in-place concrete.

1.02 RELATED WORK

A. Section 01 4529 – Testing Laboratory Services.

B. Section 32 1373 – Concrete Paving Joint Sealants

C. Section 32 1376 - Sidewalks

D. Section 33 0516 – Manholes and Structures.

E. Section 33 4000 – Storm Drainage Utilities.

1.03 SUBMITTALS

A. See Related Work

1.04 QUALITY ASSURANCE

A. Perform cast-in-place concrete work in accordance with ACI 301, unless specified otherwise in this Project Manual.

B. Keep copy of ACI 301-99 inch field office for duration of project.

C. Fly ash shall not be used in concrete with integral color.

1.05 TESTING AGENCY

A. Field testing of the concrete mix will be performed by an independent testing laboratory in accordance with Sections 01 4529.

B. Provide free access to work and cooperate with the appointed laboratory.

C. Tests of cement and aggregates may be performed to ensure conformance with requirements state herein.

1.06 REFERENCE STANDARDS

A. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

B. ACI-301-99, Specifications for Structural Concrete.

C. ACI Manual of Concrete Practice, Parts 1, 2, and 3.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Allowable Concrete Mix Temperatures: ACI 301 -99 Section 4.2.2.7.
   1. Cold Weather: Minimum 35 degrees Fahrenheit.
   2. Hot Weather: Maximum 95 degrees Fahrenheit.

B. Do not place concrete during rain, sleet, or snow unless protection is provided.

C. Keep accurate thermometer in area where work is proceeding.

PART 2 PRODUCTS

2.01 CEMENT (ACI 301-99 SECTION 4.2).

A. Portland Cement: ASTM C150, Type 1.

B. Use one brand and type of cement throughout project unless otherwise specified.

2.02 ADMIXTURES (ACI 301-99 SECTION 4.2)

A. Add air-entraining agent as indicated in ACI 301-99 Section 4.2.1.4.

B. Use of accelerating admixtures such as salts, chemicals, or other foreign materials in cold weather will not be allowed. Use no other admixtures without prior approval of the Architect/Engineer.

C. Use of set – retarding admixtures during hot weather will not be allowed.

2.03 STRENGTH (ACI 301-99 SECTION 1.7.4)

A. Provide concrete of following strength: Compressive strength (28day): 3,500 psi, except where noted otherwise in the Contract Documents

2.04 AIR ENTRAINMENT (ACI 301-99 SECTION 4.2.1.4)

A. Add air-entraining agent to concrete mix for concrete work exposed to exterior.

2.05 SLUMP (ACI 301-99 SECTION 4.2.2.2)

A. Contractor shall provide slump cone and test slump for each load of concrete.

B. Minimum, slump for all concrete work: 3 inches.

C. Slump for consolidation by vibration: 4 inches maximum.

D. Slump for slabs and consolidation other than by vibration: 5 inches maximum.

2.06 PROPORTIONS

A. Selection of proportions for normal weight concrete: Method 1, Method 2, or Method 3, Contractor's Option.

B. Fine aggregate shall conform to the requirements of ASTM Specification C-33, latest edition, and shall consist of clean, fresh water sand graded uniformly to conform to Paragraph 4 of the above referenced Specification C-33.

C. Coarse aggregate shall conform to the requirements of ASTM Specification C-33, latest edition, using standard grading size 1 -1/2" to No. 4 of washed gravel or crushed stone meeting requirements above and soundness requirements of ASTM C-33.

D. Water: Clean and free of injurious amounts of oil, acids, alkalis, organic materials, or other deleterious substances.

2.07 REINFORCING STEEL (ACI 301-99 SECTION 3), WHERE APPLICABLE.

A. Where shown on plans and details.

B. Reinforcing Steel: 60 ksi yield grade; deformed billet steel bars, ASTM A615; plain finish.

C. Welded Steel Wire Fabric: plain type, ASTM A 185; in coiled rolls, plain finish, 6x6-W1.4 x W1.4 or 6x6 – W2.9 X W2.9 as shown on the Drawings.

2.08 ACCESSORIES

A. Pre-molded expansion joint fillers: ASTM D1751, See plans and details for width / thickness of joint. Refer to ACI 301-99 Section 10.2.5.

2.09 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Mix concrete until there is a uniform distribution of the materials and the mass is homogeneous in consistency and colors. Continue mixing for at least 1 -1/2 minutes after all the ingredients are in the mixer.

PART 3 EXECUTION

3.01 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:

1. Ensure that excavation and formwork are completed and within the allowed tolerances.
2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
3. Check that reinforcement is secured in place.
4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.02 FORMWORK (ACI 301-99 SECTION 2)

A. Obtain Architect/Engineer's review for use of earth forms. When using earth forms, hand-trim sides and bottoms, and remove loose dirt prior to placing concrete.

B. Tolerances for Formed Services: (Comply with ACI 301-99 Section 2)

3.03 FORM SURFACES PREPARATION (ACI 301-99 SECTION 2)

A. Apply form release agent on formwork in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices and embedded parts. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

3.04 FINISHING FORMED SURFACES

A. Formed Surfaces Finishes: Provide rough form finish (ACI 301-99 Section 2) at all surfaces not exposed to view. Provide smooth rubbed finished (ACI 301-99 Section 2) at all surfaces exposed to view.

3.05 REMOVAL OF FORMS (ACI 301-99 SECTION 2)

A. Do not remove forms, shores, and bracing until concrete has gained sufficient strength to carry its own weight, construction loads, and design loads which are liable to be imposed upon it. Verify strength of concrete by compressive test results.

3.06 PLACING REINFORCING

A. Reinforcing shall be unpainted and uncoated, free from rust or scale and shall be cleaned and straightened before being shaped and in position.

B. Position reinforcing accurately and tie securely.

C. Support foot reinforcing on support chairs or concrete grout at maximum 3 feet on center each way to insure proper depth from bottom.

D. Wire dowels to longitudinal bars and place top bars in perfect alignment by the use of wood templates placed 2 inches from the top of the form.

E. Support wire mesh on support chairs, or other approved means, at no greater than three feet on center way to hold reinforcing in the center of the slab or as shown on the drawings.
1. Do not depend on lifting mesh as concrete is being poured.
2. Lap sides and ends not less than one wire spacing in slabs on grade and not less than 12 inches in structural slabs.

F. Provide 3 inches of concrete between reinforcing and the ground, unless detailed otherwise, where concrete is poured against the ground.

G. If, after the removal of forms, concrete surfaces are to be in contact with the ground or exposed to the weather:
1. Bars larger than No.5: Protect with 2 inches of concrete.
2. No. 5 bars and smaller: Protect with 1 1/2 inches of concrete.

H. Concrete covering for any reinforcing at surfaces not exposed directly to the ground or weather: Protect with 1 -1/2 inches of concrete.

3.07 PLACING CONCRETE

A. Convey concrete from mixer to final position by method which will prevent separation or loss of material.

B. Maximum height of concrete free fall; 60 inches.

C. Regulate rate of placement so concrete remains plastic and flows into position.

D. Deposit concrete in continuous operation until panel or section is completed.

E. Do not use concrete that has set and do not re-temper or use concrete that has been mixed for more than 1½ hours.

3.08 CONSOLIDATING CONCRETE:

A. Use mechanical vibrating equipment for consolidation.

B. Vertically insert and remove hand-held vibrators at points 18 inches to 30 inches apart, inserting to within 6 inches of bottom of freshly poured concrete.

C. Do not use vibrators to transport concrete forms.

D. Minimum vibrators frequencies: 6000 impulses per minute.

E. Vibrate concrete minimum amount required for consolidation.

F. Keep spare vibrator on hand during concrete placing operation.

G. Make sure the concrete is thoroughly worked around the reinforcing, the embedded items, and into corners of forms.

3.09 SLABS (ACI 301-99 SECTION 5)

A. Finish concrete slab surfaces in accordance with ACI 301-99 Section 5:
   1. Uniformly spread, screed, and float slabs. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.
   2. Light broom finish exterior surfaces, expect exposed aggregate.

B. Sidewalks: Finish sidewalks in accordance with Section 32 13 76.

3.10 CURING

A. Cure Slabs: Use damp method as per ACI 301-99 Section 5.

B. Cure Walls above Grade: Use moisture-retaining covering as approved by Architect/Engineer in accordance with ACI 308.

3.11 WELDING (ACI 301-99 SECTION 3)

A. Welding Reinforcing Steel: Not allowed.

3.12 CONSTRUCTION JOINTS

A. Install control expansion joints in accordance with ACI 301-99 Section 5

B. Place expansion and contraction joints shown on plans. Where joints are not illustrated, provide control joints for every 100 SF of surface area and expansion joints for every 400 SF of surface area. Where possible, make joints coincide with joints in adjacent concrete.

C. Fit joints with filler of required profiles. Recess ¼ inch below finished concrete surface.

3.13 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through concrete members.

B. Coordinate work of other sections and cooperate with trade involved in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

3.14 REPAIR OF SURFACE DEFECTS (ACI 301-99 SECTION 5.3.7)

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Modify or replace concrete not conforming to required lines, detail, and elevation.

C. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, repair, or replace exposed architectural concrete except upon express direction of Architect/Engineer.

3.15 FIELD QUALITY CONTROL

A. Four (4) concrete test cylinders will be taken by the testing laboratory for every 40 cu. yds., or fraction thereof, of concrete placed. Not less than one (1) set of test cylinders shall be taken for each day's pour.

B. One (1) additional test cylinder will be taken during cold weather concreting and be cured on job site under same conditions as concrete it represents.

C. One (1) slump test will be taken by the testing laboratory for each set of test cylinders taken and for each separate batch of concrete placed.

D. Compression test cylinders: Test cylinders shall be cast on the project site by a representative of the testing laboratory.
   1. Make cylinders according to ASTM C31.
   2. Make additional sets of test cylinders for curing under job conditions:
      a. When it is needed to determine when to remove forms.
      b. When to put a structure into service.
      c. When temperature extremes are expected during the curing test period.
   3. Make test cylinders in the presence of Architect/Engineer.
   4. Properly marked prepared test cylinders and fill out the card supplied by the testing laboratory with instructions on when to make test breaks and where to send the test results.
   5. Transport in a protected condition, each set of prepared and marked test cylinders to the designated testing laboratory for curing and testing as soon as the cylinders can be transported without damage.

E. Compression Testing concrete Cylinders ASTM C-39: by commercial testing laboratory.
   1. Cure cylinders in laboratory until time for testing.
   2. Test each set of cylinders at 7 days and 28 days after pouring.
   3. Tabulation of breakage schedule and action:
   4. Specified strength of 3,500 psi at 28 days
   5. Test Break Action
   6. 7 day Less than 2400 psi Contractor notify A/E
   7. 2400-3500 psi Break 28 day cylinder
   8. Over 3500 psi Stop Testing
      a. 28 day Less than 3500 psi Contractor notify Architect, investigate
      b. reason for low break and report in writing to
      c. AE.
   9. For testing cylinders for specified compressive strength other than 3,500 psi, see the Architect/Engineer.

F. In Case of Low Compression Test Results:
   1. Architect/Engineer will have right to order change in the mix design, costs to be borne by the contractor.
   2. Architect/Engineer will have right to order core tests of the concrete in accordance with SCI C42, or load tests of the structure, the cost to be borne by the Contractor for either test.

3.16 PROTECTION OF COMPLETED WORK

A. During curing period, protect the concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

END OF SECTION

SECTION 32 1200
FLEXIBLE PAVEMENT

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

B. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.02 WORK INCLUDED

A. Prepare subgrade to receive base course.

B. Provide compacted base course.

C. Prime base course and place asphaltic concrete hot mix (ACHM) binder course.

D. Tack base course and place ACHM surface course.

1.03 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 1613 – Concrete Curb and Gutter

C. Section 33 4000 – Storm Drainage Utilities

1.04 SUBMITTALS

A. See Related Work

1.05 REFERENCES

A. Arkansas Department of Transportation (ARDOT).
   1. Standard Specifications for Highway Construction, Edition of 2014, hereafter referred to as “ARDOT Standard Specifications”.

PART 2 PRODUCTS

2.01 BASE COURSE MATERIALS

A. Crushed Stone: Class 7, meeting the requirements of Section 303 of the ARDOT Standard Specifications, or approved equal.

B. Prime Coat: Medium curing liquid asphalt, MC-30, or approved equal, meeting the requirements of Section 401 of the ARDOT Standard Specifications.

C. Tack Coat: Shall be applied as specified and meeting the requirements of Section 401 of the ARDOT Standard Specifications.

2.02 ASPHALT PAVEMENT MATERIALS

A. ACHM Surface Course:
   1. PG 64-22 mix as described in Sections 407 and 409 of the ARDOT Standard Specifications.
   2. The surface course shall be composed of a mixture of mineral aggregate and asphalt cement in the proportions by weight for the type mixture designated.

B. ACHM Binder Course:
   1. PG 64-22 mix as described in Section 407 and 409 of the ARDOT Standard Specifications.
   2. The binder course shall be composed of mixture of mineral aggregate and asphalt cement in the proportions by weight for the type mixture designated.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Ensure grading of the subgrade to the required elevation.

B. Scarify to a depth of six inches the subgrade where the base course is to be placed.

C. Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess of moisture exists, rework and aerate subgrade until optimum moisture content is obtained.

D. Re-compact the subgrade to a minimum of 95% of the maximum dry density at or near the option moisture content as determined by ASTM D1557.

E. Before final rolling, shape the entire area to the required cross section, adding additional subsoil as required and compact the subgrade surface to the required density.

3.02 PLACEMENT OF BASE COURSE

A. Place the crushed stone base material over the prepared subgrade in accordance with the construction methods described in Section 303 of the ARDOT Standard Specifications.

B. Add water during compaction to bring the base course materials to optimum moisture content. When excess moisture exists, rework the base course materials until optimum moisture content is obtained.

C. Compact the base course to 100% of the maximum dry density as determined by ASTM D1557.

3.03 PLACE PRIME AND TACK COAT

A. Apply the bituminous prime coat to the compacted base at the rate of 0.3 to 0.4 gallons per square yard. Apply the bituminous tack cost to the prepared base at the rate of 0.03 gallon to 0.10 gallon per square yard as designated by the Engineer.

B. Clean the base course surface and place the prime and tack coats in accordance with the requirements of Section 401 of the ARDOT Standard Specifications.

3.04 PLACING ACHM SURFACE COURSE

A. Construction Methods: Section 410, ARDOT Standard Specifications.

B. Temperature range mix.
   1. When discharged from mixer: 285 degrees Fahrenheit to 325 degrees Fahrenheit.
   2. When placed on base course: 275 degrees Fahrenheit. to 325 degrees Fahrenheit.

C. Temperature of air: Do not place ACHM when air temperature in the shade is below 40 degrees Fahrenheit.

D. Place asphalt pavement to compacted depth shown on Drawing.

E. Compact to required density, with approved rolling equipment. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

F. Required density: 92% - 96% of maximum theoretical density.

G. Carry out compaction in three operations in pass sequence. Ensure each pass of roller overlaps previous passes to ensure smooth surface free of roller marks. Keep roller wheels sufficiently moist so as not to pick up material.

H. Perform hand tamping in areas not accessible to rolling equipment.

I. Ensure joints made during paving operations and at connection to existing pavement are straight, clean, vertical and free of broken or loose material. Construct joints to ensure a continuous bond between the courses and to obtain the required density. Provide all joints with the same texture as other sections of the course and meet the requirements for smoothness and grade.

J. Ensure surface of completed asphalt pavement is true to lines, profiles and elevations indicated, and is free from depressions exceeding ¼ inch when measured with a 10 foot straightedge.

K. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature.

3.05 FIELD QUALITY CONTROL

A. Testing laboratory will make in-place tests of density and moisture content of the subgrade and the base course in accordance with ASTM D6938.

B. Testing laboratory will make density tests of compacted asphalt paving in accordance with ASTM D 2950.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

B. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

1.02 WORK INCLUDED

A. Prepare subgrade to receive base course materials for traffic bearing drive.

B. Place and compact base course materials for drive.

C. Concrete drive complete with reinforcement.

1.03 RELATED WORK

A. Section 32 1373 – Concrete Paving Joint Sealants

B. Section 31 2000 - Earth Moving

C. Section 32 1376 - Sidewalks

D. Section 32 1613 - Concrete Curb & Gutters

1.04 SUBMITTAL

A. See Related Work

1.05 REFERENCES

A. ASTM C150- Portland Cement.

B. ASTM C94 – Ready Mixed Concrete.

C. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 – Deformed and Plain Billet – Steel Bar for Concrete Reinforcement.

E. ASTM D1751 – Preformed Expansion Joint Filler for concrete Paving and Structural construction.

1.06 INSPECTION AND TESTING

A. Inspection and testing of concrete will be performed by a firm approved by the owner and paid for by the Contractor, in accordance with Section 01 4529.

B. Three (3) concrete test cylinders will be taken during cold weather concreting, and be cured on job site under same conditions as concrete it represents.

C. One (1) slump test will be taken for each set of test cylinders taken.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Gravel Base: Angular crushed natural stone: free shale, clay and friable materials and debris.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C150; Normal –Type I. Materials for concrete paving shall conform to the requirements for Sections 32 0523–Concrete Work.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

2.03 REINFORCEMENT

A. Reinforcing Steel: (60) yield strength; plain and deformed billet steel bars: ASTM A615; plain finish.

B. Welded Steel Wire Fabric: Plain type, ASTM, 6” x 6: W2.9x W2.9 size.

C. Tie Wire: Minimum 16 gage annealed type, or patented system acceptable to Architect/Engineer.

2.04 FORMWORK AND ACCESSORIES

A. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete.

B. Joint Filler: Minimum ½-inch thick asphaltic impregnated fiberboard ASTM D1751.

C. Concrete Curing Compound: Chlorinated rubber type: clear color; ASTM C309.

2.05 CONCRETE MIX

A. Mix and proportion to produce minimum 3500 psi concrete at 28 days with maximum slump of 3 inches and 4 to 6 percent air entrainment.

B. Use accelerating admixtures in cold weather only when acceptable to Architect/Engineer. Use of admixtures shall not relax cold weather placement requirements. Do not use calcium chloride.

C. Use set-retarding admixtures during hot weather only when acceptable to Architect/Engineer.

PART 3 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations.

B. Fill soft spots and hollows with additional fill.

3.02 PLACEMENT OF GRAVEL FILL AND SAND CUSHION

A. Place and level gravel fill over prepared subgrade to a compacted depth indicated on drawings true to lines and levels.

B. During concrete placement, keep base sufficiently moist to prevent excessive absorption of water from freshly placed concrete.

3.03 FORMING

A. Form vertical surfaces to full depth and securely position to required lines and levels. Ensure form ties are not placed so as to pass through concrete.

B. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

3.04 PLACING REINFORCEMENT

A. Reinforce concrete drives: Allow for minimum 1 -1/2 inch concrete cover.

B. Do not extend wire mesh reinforcing through expansion and contraction joints. Provide dowelled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.05 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:
   1. Ensure that excavation and formwork are completed and within the allowed tolerances.
   2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
   3. Check that reinforcement is secured in place.
   4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.06 FORMING EXPANSION AND CONTRACTION JOINTS

A. Install control expansion joints in accordance with ACI 301-99 Section 5

B. Place expansion and contraction joints shown on plans. Where joints are not illustrated, provide control joints for every 100 SF of surface area and expansion joints for every 400 SF of surface area. Where possible, make joints coincide with joints in adjacent concrete.

C. Fit joints with filler of required profiles, set drives perpendicular to longitudinal axis of drives. Recess ¼ inch below finished concrete surface.

3.07 PLACING CONCRETE

A. Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate.

B. Avoid working mortar to surface.

C. Make ¼-inch wide dummy joints as indicated on Drawings.

D. Round all edges, including edges of dummy and expansion and contraction joints, with ¼-inch radius edging tool.

E. Where paved surfaces are adjacent to walks, make concrete curbs and gutters integral with walks. Make expansion and contraction joints of curbs coincide with walk joints. Provide dummy joint at line between walks and curbs.

F. All drives, sidewalks, ramps, and stairs are to have a broom finish applied to the surfaces, unless otherwise noted.

G. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet when measured with straightedge.

H. Apply curing compound on finished surfaces immediately after placement. Apply in accordance with manufacturer's recommendations.

I. All expansion joints must be sealed with an approved joint sealant.

END OF SECTION

SECTION 32 1373
CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

B. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2000 (Reapproved 2011).

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contact, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. Section Includes:
   1. Cold-applied joint sealants.
   2. Hot-applied joint sealants.

B. Related Work:
   1. Section 32 1313 - Concrete Paving
   2. Section 32 1376 – Sidewalks
   3. Section 32 1613 – Concrete Curb & Gutter

1.04 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufactures, for testing indicated below, Samples of material that will contact of affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit no fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer’s written instructions for corrective measures including use of specially formulated primers.
   5. Testing will no be required if joint-sealant manufactures submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.05 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each kind and color of joint sealant required, provide samples with joint sealants in ½ inch wide joints formed between two 6-inch long strips of materials matching the appearance of exposed surfaces adjacent to joint sealants.

C. Pavement-Joint Sealants Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

G. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project.

B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

C. Product Testing: Testing joint sealants using a qualified agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.07 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 PRODUCTS

2.01 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joints Sealants: As selected by Architect/Engineer from manufacturer's full range, and to be confirmed with submittal.

2.02 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work, include, but are not limited to, the following:
      a. Crafco Inc., and ERGON company; RoadSaver Silicone.
      b. Dow Corning Corporation; 888.
      c. Pecora Corporation; 301 NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work, include, but are not limited to, the following:
      a. Crafco Inc., and ERGON company; RoadSaver Silicone SL.
      b. Dow Corning Corporation; 890-SL
      c. Pecora Corporation; 300 SL

C. Multicomponent, Pourable, Traffic-Grade, Erethane Joint Sealant for Concrete: ASTM C920, Type M. Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Pecora Corporation; Urespan NR-200.

2.03 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Crafco Inc., an ERGON company; Superseal444/777.

B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Meadows, W.R., Inc. Sealtight 3405.
    b. Right Pointe; D-3405 Hot Applied Sealant.

2.04 JOINT– SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer roads for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Roads for Cold-Applied Joint Sealant.

D. Backer Strips for Cold and Hot –Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.05 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer’s written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer’s written instructions. Confine primers to areas of join-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer’s written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealant during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place joint sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nosag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tools sealants according to the following requirements to form smooth, uniform beads of configuration indicated: to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joints sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 32 1376
SIDEWALKS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing concrete sidewalk where shown on Drawings.

B. Providing concrete handicap ramps where shown on Drawings.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 0523 – Cement and Concrete for Exterior Improvements.

C. Section 32 1373 – Concrete Paving Joint Sealants.

1.03 SUBMITTALS

A. See Related Work

1.04 REFERENCE STANDARDS

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

B. American Society for Testing and Materials (ASTM):

1. ASTM D1751, Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

PART 2 PRODUCTS

2.01 CONCRETE

A. General: Materials for use in sidewalk construction shall conform to the requirements for Section 32 0523, and shall be 3500 psi concrete.

2.02 WORK INCLUDED

A. The joint filler for all expansion joints shall be manufactured according to ASTM D1751 and shall be elastic waterproof pre-molded compound that will not become soft and push out in hot weather, nor hard and brittle and chip out in cold weather. The strips shall be ½” in thickness except where shown otherwise on the Drawings; their width shall at least equal the full thickness of the slab; and their length shall at least equal the width of the slab at the joint.

2.03 FORMS

A. Forms shall be steel or 2” nominal thickness lumber true to proper dimensions, smooth, sufficiently braced to resist springing out of shape, and accurately set to proper lines and grades. Used forms shall be free of dirt and mortar. Cross forms shall be ¼” steel of the full width and depth of the concrete work and left in place until the wearing surface has been floated and has obtained its initial set.

2.04 CURING COMPOUND

A. Liquid membrane forming curing compound conforming to AASHTO M 148, Type 2, white pigmented (all-resin base).

2.05 SURFACE TREATMENT

A. Scofield Repello FPS surface treatment for water and stain repellency to concrete surfaces.

PART 3 EXECUTION

3.01 GRADING AND SUBGRADING

A. Prepare subgrade for walks by excavating or filling to a depth below the top of an intended pavement equal to the thickness of the finished walk and in exact conformity to the grade approved by the Engineer. Remove vegetative matter or material that will not compact properly and replace with suitable material. Place all fill required to bring the subgrade to the proper

level in thin layers not exceeding 4 inches deep, and thoroughly ram, tamp or roll until it has been made compact and solid. Bring subgrade to true grade in a uniformly firm condition before placing the concrete. Do not place concrete on the subgrade until the Engineer has inspected and approved both grade and condition of subgrade.

3.02 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:
   1. Ensure that excavation and formwork are completed and within the allowed tolerances.
   2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
   3. Check that reinforcement is secured in place.
   4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.03 SETTING FORMS

A. Stake forms and hold to the established lines and grades. Provide minimum 1/8" per foot fall away from structures or as shown on the drawings.

3.04 TREATMENT

A. Wet wood and coat metal forms with oil, soft soap, or whitewash before depositing any material against them. Remove all mortar and dirt from forms that have been previously used.

3.05 MARKINGS

A. Cut surface of concrete walks into flags by marking with an edging tool having a radius of ¼". Make flags not longer than 6 feet on any side nor longer than the width of the sidewalk. Round the slabs on all surface edges, including the cross markings between flags, to a radius of ¼".

3.06 JOINTS

A. Provide an expansion joint ½" in thickness, extending full depth of the concrete and with filler as herein specified, at intervals of not more than 15 feet, or as shown on plans. Provide a similar joint ½" in thickness in each walkway at intersection of walkways. Also provide an expansion joint ½" in thickness at each intersection of sidewalk and street curb and at such other points as may be designated by the Engineer. Separate sidewalk from abutting structures by ½" expansion joints. Place expansion joints ½" in thickness extending full depth of the concrete in a square outline around each object in sidewalks, such as fire hydrants, utility poles light standards, etc.

B. All expansion joints must be sealed with an approved joint sealant.

3.07 PLACING CONCRETE

A. Place concrete only on a moist subgrade and not adjacent to or around utility structures until such structures have been set to the proper grade.

B. Transport from the mixer and place by such a means as will not cause segregation of materials or loss of ingredients. Deposit successive batches in one layer by a continuous operation, completing individual sections to the required depth and width. Do not use concrete that has taken its initial set. Fill forms and bring the concrete to the established grade by means of a strike board or straight edge. Thoroughly tamp concrete until mortar is flushed to the surface sufficiently to finish and mark the surface.

C. Spade and/or vibrate the concrete so that it will flow together and completely fill all void spaces especially along forms (including cross forms of joints) to prevent honeycombing and shall be struck off and tamped in an approved manner, until dense surface is obtained, free from porous or rough spots and at the required sections and grade.

D. Use method of placing the various sections so as to produce a straight clean-out joint between them, in order to make each section and independent unit. Do not use any concrete in excess of that needed to complete a section at the stopping of work.

E. Do not pour concrete when temperature is below 35 degrees Fahrenheit, and do not place concrete on frozen subgrade. Take all necessary precautions to prevent damage to concrete in excess of that needed to complete a section at the stopping of work.

F. At all times during construction period, maintain proper drainage, by natural flow or pumping as required, so that water will drain away from excavated areas. Do not allow water to stand in any excavations, or elsewhere, to be covered by concrete. Provide and maintain in proper working order all necessary pumping and other equipment required to maintain drainage.

3.08 FINISH

A. After the concrete has been brought to the established grade by means of a strike board and tamped to bring the mortar to surface, float to a true even surface and finish with steel trowel. After the trowel finish has taken its initial set, brush surface lightly at right angles to center line of sidewalk with a soft bristle brush.

B. Do not apply heat to the concrete surface to hasten its hardening.

3.09 CURING AND PROTECTION:

A. As soon as the concrete has hardened sufficiently to prevent damage, apply specified liquid membrane-forming curing compound in accordance with manufacturer's written instructions.

B. Protect the freshly finished concrete from hot sun and drying winds until the curing compound is applied. Do not allow the concrete surface to be damaged or pitted by raindrops. Provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the proceeding twelve hours. Erect and maintain suitable barriers to protect the concrete. Repair any section damaged from traffic or other causes occurring prior to its official acceptance. Before the sidewalk is opened to traffic, remove and dispose of the covering.

C. Apply surface treatment to all concrete surfaces per manufacturer's requirements.
   1. FREEZING TEMPERATURE

D. If at any time during the progress of the work, the temperature is predicted to drop below 35 degrees Fahrenheit within 24 hours after placement, heat the water and aggregates and take precautions to protect the work from freezing for at least five days.

END OF SECTION

SECTION 32 1613
CONCRETE CURB AND GUTTER

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

B. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

1.02 WORK INCLUDED

A. Construct cast-in-place combination curb and gutter.

1.03 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 1376 – Sidewalks.

C. Section 32 0523 – Cement & Concrete for exterior improvements.

D. Section 32 1373- Concrete Paving Joint Sealants.

1.04 SUBMITTALS

A. See Related Work

1.05 QUALITY ASSURANCE

A. Perform cast-in-place concrete in accordance with ACI 301 and Section 32 0523.
   1. Standard Specifications for Highway construction, Edition of 2014, hereafter referred to as “AHTD Standard Specifications”.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ready Mixed concrete: ASTM C94 and Articles 2.01 through 2.06 of Section 32 0523.

B. Curing Compound: ASTM C309.

C. Pre-formed expansion joint fillers: ASTM D1751-18.
   1. Thickness: ½ inch.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Grade subgrade and compact in same manner and to same density as specified in Section 31 2000 controlled fill.

3.02 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:
   1. Ensure that excavation and formwork are completed and within the allowed tolerances.
   2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
   3. Check that reinforcement is secured in place.
   4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-20 except as amended by this section.

3.03 INSTALLATION

A. Cast-in-place Concrete: Refer to Section 32 0523

1. See standard Detail Drawings for Curb and Gutter, and for Handicap Ramp.
2. Prepare subgrade in accordance with Section 31 2000.
3. Set forms to line and grade.
4. Install forms over full length of curb.
5. Form contraction joints at maximum 10 feet spacing using steel templates, division plates or sawcuts.
6. Remove templates or plates as soon as concrete has hardened sufficiently to retain its shape.
7. Install preformed expansion joint fillers at maximum 40 feet spacing, at curb returns, and behind curb at abutment to sidewalks and other structures.
8. Place top of expansion joint material ¼ inch below curb surface.
9. Place concrete in position without separation of concrete materials.
10. Consolidate concrete with mechanical vibrators.
11. Round face of curbs at top with finishing tool of correct radius.
12. Finish exposed surfaces with wood float followed by light brushing with broom.
13. Apply curing material and cure for seven days.

B. Repair of surface defects: Comply with requirements of Section 32 0523.

C. Field Quality Control: Comply with requirements of Section 32 0523.

D. Protection of Completed Work: Comply with requirements of Section 32 0523.

END OF SECTION

SECTION 32 1723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing pavement markings as shown on Drawings.

1.02 REFERENCE STANDARDS

A. Federal Specifications (FS):
   1. TT-P-115E Paint, Traffic, Highway, White and Yellow.
   2. TT-P-1952B Paint, Traffic, and Airfield Marking, Water Emulsion Base.

B. Federal Standard (Fed. Std.)
   1. No 141B Paint, Varnish, Lacquer, and related materials.

C. Arkansas Department of Transportation (ArDOT)
   1. Standard Specifications for Highway Construction, 2014 Edition

1.03 SUBMITTALS

A. Submit a test report showing either that the proposed batch meets all specified requirements or that a previous batch manufactured using the same formulation as that used in manufacturing the proposed batch for the following properties required in the material specification: weight per gallon, viscosity, fineness of grind, drying time, and gradation. Testing procedures and reports shall be as specified in paragraph 5 of Method 1031.2 of Fed. Std.141.

1.04 DELIVERY, HANDLING AND STORAGE

A. Deliver material in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly labeled at time of use.

B. Furnish paint in containers not larger than five gallons.

C. Store paint on project site. Store emulsion paints to prevent freezing.

1.05 SITE CONDITIONS

A. Unless other wise recommended by the paint manufacturer apply pavement markings material only when the ambient temperature is between 40 and 95 degrees Fahrenheit.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking:
   1. Manufactured according to FS TT-P-115E, FS TT-P-1952B or ArDOT Standards Specification Section 718,719, or 720.
   2. Symbol Color: White.
   3. Handicapped Access Aisles on Asphalt Paving: Color, White
   4. Handicapped Access Aisles on Concrete Paving: Color, ADA Blue
   5. Paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.
   6. Note: Verify colors with owner prior to painting.

B. Roadway:
   1. Manufactured according to ArDOT Standard Specifications Section 719 or 720.
   2. Color:
      a. Separating traffic traveling in opposite directions: Yellow
      b. Left edge of roadways: Yellow
      c. Separating two-way left turn lanes and reversible lanes from other lanes: Yellow
      d. All other applications: White
      e. Pre-molded striping and symbols as shown and called for on plans.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 30 days before application of markings materials.

B. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required.

C. Completely remove rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed.

D. Where oil or grease are present on old pavements to be marked, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

3.02 EQUIPMENT

A. General: Use only approved machines, tools, and equipment. Maintain equipment in satisfactory operating condition. Han-operated push type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small street and parking areas. Use applicator machine equipped with the necessary paint tanks and spraying nozzles. Equipment shall be capable of applying paint uniformly at coverage specified. Provide sandblasting equipment as required for cleaning surfaces to be painted. Use hand-operated spray guns for use in areas where push-type machines cannot be used.

B. Sandblasting Equipment: Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 c.f.m of air at a pressure of not less than 90 psi at the nozzle for each nozzle used.

C. During concrete placement, keep base sufficiently moist to prevent excessive absorption of water from freshly placed concrete.

3.03 APPLICATION

A. Rate of Application: Apply two (2) coats of paint at manufacturer’s recommended rate with total maximum of 320 lineal feet per gallon per coat with 4” wide stripe. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs, use a straightedge to ensure a uniform, clean, and straight stripe.

B. Paint: Apply paint in stripes of specified width to clean, dry surfaces, unless otherwise approved, only when air and pavement temperature is above 40 F and less than 95 F. Maintain paint temperature within these limits. Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guide lines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Sharply outline all edges of markings. Maintain the maximum drying time requirements of the paint specifications to prevent undue softening of bitument, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, discontinue painting operations until cause of the slow drying is determined and corrected.

3.04 PROTECTION

A. Prevent damage to newly painted surfaces by either placing small markers along newly painted lines or controlling traffic to keep vehicles away from area of newly painted lines.

END OF SECTION

SECTION 32 8400– IRRIGATION SYSTEMS

PART 1 – GENERAL

1.1. SUMMARY

a) Provide a complete automatic irrigation system using municipal water.
b) System shall support plant establishment, conserve water, and accommodate slope and freeze-thaw conditions.
c) Include pressure regulation, rain sensor shut-off, and zoning by plant type and sun exposure.
d) Drip zones for shrub and groundcover beds; spray heads for lawn areas.

1.1. REFERENCES

a) ANSI Z60.1 – American Standard for Nursery Stock.
b) ANSI A300 – Tree, Shrub, and Other Woody Plant Management Standards.
c) AOAC – Official Methods of Analysis of the Association of Official Analytical Chemists.
d) ASPA – American Sod Producers Association (for turfgrass).

1.2. QUALITY ASSURANCE

a) Landscape contractor shall have a minimum of three (3) years of experience on projects of similar scope.
b) Contractor shall verify availability of specified plant material prior to bid. Any substitutions due to unavailability must be submitted in writing with bid.
c) All plants are subject to inspection and approval by the Landscape Architect at source or upon delivery.

1.3. DELIVERY, STORAGE, AND HANDLING

a) Protect plant material during transport to prevent damage or desiccation.
b) Cover and ventilate plant material appropriately; anti-desiccant use must be approved by Owner.
c) Do not drop, lift, or handle plant material by stems or trunks. Handle from root ball or container base.
d) Store plant materials in shaded, protected locations and water regularly until planting.

1.4. JOB CONDITIONS

a) Schedule planting only during suitable weather and soil conditions.
b) Do not plant when ground is frozen or overly saturated.
c) Coordinate planting schedule with irrigation installation.

PART 2 – PRODUCTS

2.1 PIPING

a) Mainline: Class 200 PVC or equivalent, solvent-welded.
b) Lateral lines: Schedule 40 PVC for spray zones; polyethylene tubing for drip zones.
c) All pipes to be buried below frost depth or drained seasonally.

2.2 VALVES

a) Remote-control electric valves, 24V AC.
b) Pressure-regulating as needed per zone.
c) Grouped in accessible valve boxes off turf.

2.3 EMITTERS AND HEADS

a) Drip system: Pressure-compensating inline tubing, 0.6 gph @ 12" spacing.
b) Spray heads: Pressure-regulated, matched precipitation rate nozzles; minimum 4" pop-up height.
c) All heads with swing joints and check valves on slopes.

2.4 CONTROLLER
a) Smart irrigation controller with Wi-Fi and ET/weather-based scheduling.
b) Minimum 12 zones, expandable.
c) Integrated rain/freeze sensor.
d) Located in protected area with homeowner access.

2.5 BACKFLOW PREVENTION
a) RPZ assembly per local code.
b) Install above grade with freeze protection or drain provisions.

2.6 ACCESSORIES
a) PVC sleeves under pavements.
b) Color-coded direct-burial control wire.
c) Quick-coupler valves for hose access.

2.7 FERTILIZERS AND AMENDMENTS
a) Use pelletized, slow-release fertilizer with minimum nutrient content: 10% N, 10% P, 10% K.
b) Controlled-release fertilizer tablets (e.g., Agriform):
- Trees – 1 tablet per ½” trunk caliper
- Shrubs ≥5 gal – 2 tablets per plant

2.8 MULCH
a) Mulch shall be ground pine bark, clean and free of weeds, seeds, or debris.
b) Maintain 2”–3” depth in beds and tree rings; keep clear of trunks and stems.

PART 3 – EXECUTION

3.1 LAYOUT
a) Separate hydrozones for lawn, shrub, and slope.
b) Group sunny and shaded areas separately.
c) Avoid overspray on non-planted areas.
d) Use check valves and cycle/soak for slopes.

3.2 INSTALLATION
a) Trench depths: 12" lateral, 18" mainline.
b) Install sleeves prior to paving.
c) Bury drip tubing 1"–2" with mulch cover.
d) Protect from freeze in winter.

3.3 TESTING AND COMMISSIONING
a) Pressure test all lines to 100 psi for 2 hours.
b) Flush zones before emitter/nozzle installation.
c) Demonstrate function and layout to Owner.

3.4 CLOSEOUT
a) Provide zone map, controller schedule, and as-builts.
b) Include product literature and 1-year seasonal service.

3.5 GRADING AND FINAL SOIL PREPARATION
a) Fine grade all areas prior to planting. Final grades shall be:
- 1” below paving for lawn
- 2” below paving for beds and rings

b) Ensure all areas drain away from building foundations at 2% minimum slope for at least 5’.

3.6 PLANTING BACKFILL MIX
a) Tree/shrub backfill mix shall consist of:
- 2 parts topsoil

- 1 part peat moss
- 1 part sharp sand

3.7 WEED AND HERBICIDE TREATMENT

a) Treat areas with systemic herbicide 15 days prior to planting where perennial weeds exist.
b) Apply pre-emergent herbicide to beds before planting per manufacturer's instructions.

SECTION 32 9300 – PLANTS

PART 1 – GENERAL

1.1. SUMMARY

a) Provide all labor, materials, and equipment for planting and soil preparation.
b) Includes: topsoil preparation, installation, mulching, and initial maintenance.
c) Follow ANSI Z60.1 and ANSI A300 standards.
d) Coordinate with irrigation installation.

1.2. QUALITY ASSURANCE

a) Contractor Qualifications: Minimum of three years' experience on projects of similar characteristics and size.
b) Reference Standards:
    1. Soil Preparation.
    2. American Joint Committee of Horticultural Nomenclature: Standardized Plant Names, Second Edition, 1942.
    3. American Association of Nurserymen, Inc. American Standard for Nurser Stock, 1996 (ANSI Publication Z60. 1-1996).
    4. Official Method of Analysis of the Association of Official Analytical Chemists (AOAC).
c) Substitution:
    1. Install substitutions only upon written approval of the Owner/ Land. Arch.
    2. Submit substitutions possessing same characteristics as plant or material indicated.
    3. Do not substitute plants of less cost than plant indicated.
    4. Where larger plants are substituted by Contractor, substitute plants of greater value without any additional cost to Owner.
d) Quality Control:
    1. Contractor shall be responsible for all material shown on plans. Submit documentation to the Land. Arch. With bid that all plant material is available. Any and all substitutions due to unavailability must be requested in writing and submitted with bid. All plants shall be subject to inspection and approval by the Land. Arch. at place of growth or upon delivery to the site for conformity to the specifications. Such approval shall not impair the right of inspection and rejection during progress of work.
    2. The Contractor shall submit specifications of any item being used on-site upon the request of the Owner/Land. Arch.
    3. At least one plant of each species delivered to the site will have an identification tag from the supply nursery showing common and botanical plant names. Do not remove tag until after final inspection.

1.3. DELIVERY, STORAGE, AND HANDLING

a) Protect plant material during transport to prevent damage or desiccation.

b) Cover and ventilate plant material appropriately; anti-desiccant use must be approved by Owner.
c) Do not drop, lift, or handle plant material by stems or trunks. Handle from root ball or container base.
d) Store plant materials in shaded, protected locations, and water regularly until planting.

1.4. JOB CONDITIONS

a) Schedule planting only during suitable weather and soil conditions.
b) Do not plant when ground is frozen or overly saturated.
c) Coordinate planting schedule with irrigation installation.

PART 2 – PRODUCTS

2.1 SOIL

a) Stockpile and reuse topsoil where suitable.
b) Scarify all planting areas to 12” depth. Remove debris and compacted subsoil.

2.2. SOIL TESTING & AMENDMENTS

a) Submit lab tests for lawn, bed, and tree pit soils.
b) Amend to achieve:
    1. Organic matter ≥5%
    2. Loamy texture
    3. pH 6.0-7.0
c) Typical amendments: compost, pine fines, sand, lime, or sulfur.

2.3. BED PREPARATION

a) Incorporate amendments to 12” depth.
b) Fine grade for drainage.
c) Mulch shall be ground pine bark, clean and free of weeds, seeds, or debris.
d) Maintain 2”–3” depth in beds and tree rings; keep clear of trunks and stems.

2.4. TURF AREAS

a) Till to 6”, rake smooth, and fertilize.
b) Install sod unless noted otherwise. Roll and water.

PART 3 – EXECUTION

3.1. PLANT MATERIALS

a) Nursery-grown, disease-free, true to species and size.
b) Substitutions require written approval.

3.2. LARGE TREES

a) B&B or container-grown with root flare 1–2" above grade.
b) Pits 2x ball width; scarify sides/bottom.
c) Stake only if needed.

3.3. SHRUBS

a) Match root flare to finish grade.
b) Informal, staggered spacing unless otherwise shown on plan.
c) Space per mature spread and plans.

3.4. GROUNDCOVERS & PERENNIALS

a) Install in prepared soil with consistent spacing and root contact.
b) Use slope-stabilizing species where needed.
c) Drip irrigation preferred for even coverage.

3.5. MULCHING

a) Mulch all beds and tree rings with 2–3" ground pine bark mulch.
b) Keep mulch away from trunks and stems.

3.6. MAINTENANCE & CLOSEOUT

a) 90-Day Establishment Period
    1. Watering, weeding, pest/disease control
    2. Replacing or resettling plants
    3. Maintaining mulch coverage
b) Final walkthrough by Landscape Architect and Owner
c) Replace failing plants at no cost.
d) Provide:
    1. Final plant list
    2. Soil test results
    3. Tree staking/removal plan
    4. 1-year warranty on trees and shrubs

3.7. GRADING & FINAL SOIL PREPARATION

a) Fine grade all areas prior to planting. Final grades shall be:
    1. 1” below paving for lawn
    2. 2” below paving for beds and rings
b) Ensure all areas drain away from building foundations at 2% minimum slope for at least 5’.

3.8. PLANTING BACKFILL MIX

a) Tree/shrub backfill mix shall consist of:
    1. 2 parts topsoil
    2. 1 part peat moss
    3. 1 part sharp sand

3.9. WEED & HERBICIDE TREATMENT

a) Treat areas with systemic herbicide 15 days prior to planting where perennial weeds exist.
b) Apply pre-emergent herbicide to beds before planting per manufacturer’s instructions.

SECTION 32 9200 – SODDING

PART 1 – GENERAL

1.1 SUMMARY

- Provide all labor, materials, and equipment to complete turf installation using sod.
- Work includes surface preparation, fertilization, sod laying, rolling, and initial maintenance.

1.2 REFERENCES

- American Sod Producers Association (ASPA).
- AOAC Official Methods of Analysis.

1.3 QUALITY ASSURANCE

- Sod shall be nursery grown, dense, weed-free, and true to species (e.g., Bermuda, unless noted).
- Contractor shall notify Owner 10 days prior to delivery for approval.
- Sod not installed within 24 hours of harvest shall be inspected for approval.

1.4 DELIVERY, STORAGE, AND HANDLING

- Protect sod from drying, heat buildup, or physical damage during transport and on site.
- Keep sod moist and shaded before and during installation.

1.5 WARRANTY

- Contractor shall guarantee a healthy, uniform stand of grass for 90 days after acceptance.
- Repair or replace sod that fails to establish at no additional cost.

PART 2 – PRODUCTS

2.1 MATERIALS

- Sod: Nursery-grown Bermuda or approved equal. Dense, green, weed-free, cut to uniform thickness ≥ 3/4".
- Fertilizer: Pelletized with 8-4-24 NPK minimum, conforming to state fertilizer laws.
- Water: Clean, potable, available on-site.

PART 3 – EXECUTION

3.1 PREPARATION

- Fine grade soil smooth and free of debris, rocks >1" diameter.
- Till fertilizer into top 2" of soil before installation.

3.2 INSTALLATION

- Lay sod within 24 hours of harvest with staggered joints, tight fit, no gaps or overlaps.
- Roll sod immediately to ensure soil contact.
- Water sod to a depth of 2" immediately after installation.

3.3 MAINTENANCE

- Maintain moisture until sod is established.
- Begin mowing when sod reaches 4", cutting to 2.5" max.
- Replace areas that fail to establish, at no cost to Owner.

3.4 CLEANUP

- Remove excess materials and debris from site.
- Restore all disturbed areas to original condition or better.

STANDARD SPECIFICATIONS
FOR DESIGN AND CONSTRUCTION
OF WATER LINES AND SEWER LINES

CITY OF
FAYETTEVILLE
ARKANSAS

2022 EDITION

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STANDARD SPECIFICATIONS
FOR DESIGN AND CONSTRUCTION
OF WATER LINES AND SEWER LINES

2022 EDITION

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SECTION 0001 CERTIFICATION AND STATEMENT

1.01 INTENT

A. The intent of this publication is to simplify and expedite the process of water and sewer design and construction within the jurisdiction of the City of Fayetteville.

1.02 REQUIREMENTS

All rules, regulations and requirements of the Arkansas Department of Health (ADH Rules Pertaining to Public Water Systems) are the minimum standard of all plan requirements and construction and development practices to be approved by the City of Fayetteville. In such case as the Standard Specifications herein set forth exceeds the Arkansas Department of Health requirements, then this Standard Specification as approved by the City Council Fayetteville, Arkansas governs.

The Utilities Director and/or the City Engineer are responsible to the extent possible as a function of their supervisory position within the City to require compliance with the Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, latest edition, aka "Rules and Regulations Pertaining to Public Water Systems".

All rules, regulations and requirements of the Arkansas Board of Licensure For Professional Engineers and Professional Surveyors shall be the minimum standard for professional surveying and for professional engineering.

Standard construction details prepared by the City of Fayetteville Engineering Division are available from the City Engineer. In the case of a conflict between the Standard construction details prepared by the City of Fayetteville Engineering Division and the text of these Standard Specifications, then the text of these Standard Specifications govern unless an exception or variance is otherwise granted.

Nothing within this Standard Specification is intended to, or can, replace any latest edition minimum requirement by City Ordinance or Arkansas State Rules, Law or Regulations or any Federal Law or Regulation.

The Engineer of Record is responsible for their design and compliance with City of Fayetteville Specifications, ADH Rules Pertaining to Public Water Systems and State of Arkansas Rules, Regulations and Laws and any Federal Law, Rule or Regulation.

These Specifications do not replace the Engineer of Record's specifications and contract documents, however these specifications set forth the minimum requirements for design and construction of all water and sanitary sewer within the jurisdiction of the City of Fayetteville.

These Specifications shall not be copied, reproduced or physically included within any private or public project documents without the prior written consent of the City of Fayetteville.

The City of Fayetteville, and the City of Fayetteville Utilities Engineer, accept no liability arising from any use or reuse of these specifications.

1.03 CITY STANDARDS

The basis for the STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2022 Edition is as follows:

A. Previous editions of City of Fayetteville water and/or sewer standards.

   The following previous editions of Water and Sanitary Sewer minimum standards were found in the files and utilized in the current edition.

   1. City of Fayetteville 1994 Minimum Requirements for Water, Sewer, Streets, Drainage and Inspection by Donald Bunn, P.E., City Engineer.

   2. City of Fayetteville Water and Sewer standards 1995 by Donald Bunn, P.E., City Engineer.

   3. City of Fayetteville 1996 Standard Water Line Specifications 1996 Donald Bunn, P.E., City Engineer, as further approved by the City's Water and Sewer Committee and the City Council by Resolution 46-96 on April 2, 1996.

   4. STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2017 Edition

B. Other published City Standard Specifications utilized in our region, with specific acknowledgement to the City of Bentonville.

C. Meetings and review with City of Fayetteville Engineering Division staff, the Utilities Director, the Utitlies Operation Manager, and the Utilities Field Supervisors.

D. Public review available at the City of Fayetteville website, at the City of Fayetteville Water and Sewer Committee meetings, and at the City of Fayetteville City Council meeting.

E. Review and Approval by the Arkansas Department of Health.

END OF SECTION 0001

SECTION 1000 GENERAL REQUIREMENTS

1.01 GENERAL

A. The intent of this publication is to simplify and expedite the process of water and sewer design and construction with the jurisdiction of the City of Fayetteville.

All rules, regulations and requirements of the Arkansas Department of Health (ADH Rules Pertaining to Public Water Systems) are the minimum standard of all plan requirements and construction and development practices to be approved by the City of Fayetteville. In such case as the Standard Specifications herein set forth exceeds the Arkansas Department of Health requirements, then this Standard Specification as approved by the City Council Fayetteville, Arkansas shall govern.

Additionally, this Standard Specification includes the requirement that the minimum standards of design and construction specified herein, that directly affects health and safety, must further comply with the recommendations of both (1) the 10 States Standards (GLUMRB) and (2) the American Water Works Association (AWWA). Any conflict that directly affects health and safety between these Standard Specifications and the recommendations from the 10 States Standards, or the recommendations from AWWA, must be resolved to provide the greatest protection of health and safety.

Incorporation by reference: The Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, lasted edition, aka "Rules and Regulations Pertaining to Public Water Systems"; and the National Primary Drinking water Regulations found in 40 CFR Parts 141, 142 and 143 are incorporated by reference into this Standard Specification.

All rules, regulations and requirements of the Arkansas Board of Licensure For Professional Engineers and Professional Surveyors shall be the minimum standard for professional surveying and for professional engineering.

Special conditions may arise on projects that are not covered in these Specifications. Such special conditions must be submitted to the City Engineer or Utilities Division for review and approval.

Standard construction details prepared by the City of Fayetteville Engineering Division are available from the City Engineer. In the case of a conflict between the Standard construction details prepared by the City of Fayetteville Engineering Division and the text of these Standard Specifications, then the text of these Standard Specifications govern unless an exception or variance is granted.

B. This Standard Specification applies to all water and sewer design and construction within the jurisdiction of the City of Fayetteville and as follows:

This publication specifically applies, but is not limited to "Subdivision", "Large Scale Development" and other development as defined by City ordinances.

This publication provides the minimum standards to be utilized by the Engineer of Record in producing project specific specifications for a Capital Project (a.k.a. Capital Improvement Program/Project or CIP). The Engineer of Record for a Capital Project may use or adapt these Standard Specifications by express permission only. The Engineer of Record for a Capital Project shall prepare and provide project specific technical specifications.

Maintenance performed by City forces "in-house" shall utilize these specifications under the direction of the Utilities Director.

The Utilities Director and/or the City Engineer are responsible to the extent possible as a function of their supervisory position within the City to require compliance with the Arkansas State Board of Health, Department of Health Center for Local Public Health Environmental Health Branch, Engineering Section, Rules and Regulations Pertaining to Public Water Systems, lasted edition, aka "Rules and Regulations Pertaining to Public Water Systems".

Nothing within this Specifications is intended to, or can, replace any minimum requirement by City Ordinance or State Law.

This standard specification is not intended to cover all operation, maintenance, purchasing, warehousing, and emergency scenarios that arise in the City's operation of a public water distribution system and public sewer collection system, but rather intended to apply to new construction within the City's service boundary.

C. The Engineer of Record is responsible for their design and compliance with latest edition City of Fayetteville Ordinances and Specifications, ADH Rules Pertaining to Public Water Systems and State of Arkansas Rules, Regulations and Laws, or any Federal Law, Rule or Regulation.

These Specifications do not replace the Engineer of Record's specifications and contract documents, however these specifications set forth the minimum requirements for design and construction of all water and sanitary sewer within the jurisdiction of the City of Fayetteville. These specifications may be included by reference only in the Engineer of Record's documents.

D. The Engineer of Record for public, private and City-forces "in-house" projects designed and constructed under the requirements of these Specifications, shall provide to the Utilities engineer and copy to the City Engineer a sealed (PE) letter report stating that the design and construction of the water and/or sewer improvements met the minimum requirements of these Specifications. This sealed letter report will also contain documentation of any special conditions or additions to these Specifications for the specific project.

E. These specifications shall not be copied, reproduced or physically included within any private or public project documents without the prior written consent of the City of Fayetteville.

The City, and the Utilities Engineer, accept no liability arising from any use or reuse of these specifications.

F. Comprehensive construction observation services shall be provided by, or under the direction of, a professional engineer as defined by AR §17-30-101.

G. The City Engineer's office is responsible for the issuance of construction permits for the installation of water and sewer facilities constructed in the City of Fayetteville as required by the City of Fayetteville Unified Development Code. The City's Utilities Engineer is responsible to assist the City Engineer's office as directed by the Utilities Director.

The City's Utilities Engineer is responsible for review and recommendations, or assisting the City Engineer with review and recommendations, of the City's Capital Improvement Projects requiring City Council approval.

All water and/or sewer capital project design, including water and/or sewer included in other capital projects such as roadway improvements, designed by consultant or by City engineers, will be reviewed and approved by the Utilities Director or the Utilities Engineer as appropriate.

H. The City of Fayetteville is not responsible, nor bears any liability for the Contractor's means, methods, techniques, sequences, procedures of construction or the safety precautions and programs incident thereto in performing or furnishing any of the work.

I. Maintenance Bond: Once the City accepts the project for ownership, the Owner shall be responsible for the provision to the City of a two (2) year maintenance bond for 25 percent of the construction cost of water lines and sewer lines, which shall cover defects in materials and workmanship. A walk-through shall be performed at the end of the two year period and all deficiencies corrected prior to release of the bond. City maintenance shall begin after release of the Two (2) year Maintenance Bond.

J. Change's or addendums to this document shall require formal approvals and addendums in compliance with professional standards of practice and Arkansas Professional Engineering rules and regulations.

K. Administration, Appeals, Variances and Exceptions:

Administration, Appeals and Variances are defined in Chapters 152, 155 and 156 of the City of Fayetteville Unified Development Code and as follows:

When the Utilities Director and/or the City Engineer determines that application of the standards within this Standard Specification would cause undue hardship, or unnecessary

practical problems for a specific project, then an exception or variance to this Standard Specification may be reviewed on a case by case basis and may be granted by the Utilities Director and/or City Engineer. An exception or variance that is granted may be conditioned by requiring other standards to safeguard the purposes of this Standard Specification.

No exception or variance can violate minimum Arkansas Health Department requirements, or the Arkansas Board of Licensure for Professional Engineers and Professional Surveyors Board Laws and Rules, City Ordinances or State or Federal Law.

Requests that are Professional Engineering shall be submitted by and reviewed by a licensed Professional Engineer.

Such exception or variance request will be approved or denied by written communication by the Utilities Director and/or City Engineer as appropriate to existing regulations. Engineering plans reviewed and approved by the City do not grant or imply a variance to these Specifications. Variances must be requested by the Engineer of Record and approved in writing by the City of Fayetteville prior to start of work.
If an exception or variance is granted then a copy of the exception or variance must be provided by the Engineer of Record to the Arkansas Department of Health.

L. Questions and comments concerning theses Specifications should be directed to the Utilities Director, 113 W. Mountain St., Fayetteville, Arkansas, 72701 (479) 575-8386.

1.02 DEFINITIONS

A. City – The City of Fayetteville. Throughout this document, the name City of Fayetteville applies for all entities in the City of Fayetteville water and/or sewer service and jurisdiction areas.

B. City of Fayetteville Utilities Department –The Utilities Department is comprised of 4 major divisions with a common goal of providing vital city services to the citizens of Fayetteville:

Utilities Management and Capital Projects
Wastewater Treatment
Water and Sewer Operations Division
Water & Sewer Service Set Up & Billing

C. City of Fayetteville Engineering Division - The Engineering Division:

Provides design and project management for city infrastructure projects.
Reviews development proposals for compliance with city criteria such as water, sewer, streets, drainage, grading and other technical requirements.
Manages the planning, design, and permitting of trails projects and oversees construction of trails by the Transportation Division or private contractors.
Assists in the acquisition and sale of city property, right of way, easements, etc.
Manages miscellaneous stormwater and water quality initiatives.
Is responsible for ensuring compliance with

The City's NPDES Stormwater Permit issued through the Arkansas Department of Environmental Quality.
The City's floodplain regulations.

D. Engineer, and/or Engineer of Record – A qualified Professional Engineer licensed in the State of Arkansas, for the Owner, City or Governmental agency.

E. STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF WATER LINES AND SEWER LINES, 2022 Edition – also referred to as "standards" or "minimum standards" or "specifications" or "Standard Specification(s)" within this document.

F. Design – Includes, but is not limited to, all requirements of:

1. Arkansas State Law Title 22 - Public Property Chapter 9 – Public Works Subchapter 1 – General Provisions 22-9-101 -Observation by registered professionals required.

2. Arkansas Board of Licensure for Professional Engineers and Professional Surveyors, Board Laws and Rules Handbook.

3. Arkansas Department of Health requirements, including but not limited to, "Rules and Regulations Pertaining to Public Water Systems" XXI. Submission of Plans and Specifications.

G. Comprehensive construction observation services -

1. Observation and inspection services must comply with Arkansas State Law Title 22 - Public Property Chapter 9 – Public Works Subchapter 1 – General Provisions 22-9-101 - Observation by registered professionals required.

2. As required by the City of Fayetteville. Observation and inspection includes, but is not limited to, periodic visits to construction site to observe the progress and quality of the executed work to determine compliance with approved plans and specifications and the standards or requirements as set forth in the project approval or permit.

If deemed necessary by the City of Fayetteville, the Engineer of Record shall provide qualified full time Resident Inspection during part or all of the executed work for the project.

3. As required by the Arkansas Department of Health.

4. As further defined in this Standard Specification.

H. Owner – Any Individual, partnership, firm, corporation or other entity who, as property owner, is initiating the work.

I. Provide – Furnish and install, complete in place, operating, tested and approved.

J. Products – The materials, systems, and equipment provided by the Contractor.

K. 10 States Standards – The recommended standards and polices prepared by Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMB). Standards include: Recommended Standards for Waterworks and Recommended Standards for Wastewater Facilities, latest editions.

1.03 LAWS, REGULATIONS AND ORDINANCES

A. All Federal, State, County and Municipal Laws, Regulations, or Ordinances shall be complied with on all projects. Where the requirements of another jurisdictional authority having influence on work outside the purview of the City of Fayetteville are greater than that provided by these Specifications, the work shall conform to the greater requirement of that respective jurisdictional authority.

1.04 PERMITS AND LICENSES

A. City of Fayetteville construction permits for Development projects shall be obtained from the City Engineer's Office for the installation of all water and/or sewer facilities in accordance with the City Ordinances, City Engineering standards and these Specifications.

B. All other permits required to accomplish the work shall be the responsibility of the owner or engineer. Such permits may include but are not limited to permits for work within Highway Department R/W, railroad crossing permits, "Notice of Intent" for Erosion Control (Arkansas Department of Environmental Quality). Work shall not be started without the appropriate permit(s) in place.

1.05 DOMESTIC USA MANUFACTURE

A. Domestic United States of America (USA) manufacture. Product-specific requirements for Domestic manufacture are noted within the “product” sections of this specification for each product.

B. American Iron and Steel (AIS) requirements.

a. The American Iron and Steel (AIS) requirements of the Consolidated Appropriations Act of 2014 Public Law 113-76 and further requirements including, but not limited to P.L. 113-121, 114-113 and 608 of Title 33 of the United States Code and latest codes/laws as may be provided, are a separate and additional consideration to these Specifications based upon Clean Water and Safe Water SRF Federal and State funding sources.

1.06 PLANS AND SPECIFICATIONS - SUBMITTAL AND APPROVAL

A. Detailed plans and specifications shall be required for all water and/or sewer extensions, facilities or modifications and shall be prepared by a qualified professional engineer

registered to do business in the State of Arkansas. These detailed plans and specifications shall be submitted to the City for review and approval.

B. The plans and specifications shall be first approved in writing by the City Engineer or Utilities Engineer as applicable for the project and then shall be forwarded to the Arkansas Department of Health by the Engineer of Record for their (ADH) approval. In no case shall any water or sewer construction be allowed before the City has written approval from the Arkansas Department of Health.

C. The Engineer of Record must approve all material prior to installation.

D. The Owners of the project are responsible for acquiring and recording all easements and giving all notices necessary and incidental to the work.

E. Private water lines constructed for fire prevention purposes which have no metering device or backflow prevention device at the point of tie-in to the City main shall be treated as a public line and be subject to these Standard Specifications as far as engineering, construction techniques, materials, testing, and inspections are concerned.

F. For projects which require formal erosion control plans by ordinance or standards, the construction may not begin without an approved erosion control plan on file with the City. Minimum erosion control measures are required for all projects. It is the responsibility of the owner and contractor to comply with the Arkansas Department of Environmental Quality (ADEQ) requirements.

G. A pre-construction conference involving the Engineer of Record, Contractor, and the City is required prior to beginning construction. One full set of construction drawings will be provided to the Water and Sewer Department prior to the pre-construction meeting.

H. Provide legible, professional documents meeting the requirements of Ten States Standards and as follows to City Engineering and/or the Utilities for review and approval.

Plans should be drawn to a scale suitable for adequately showing the facilities proposed as stipulated herein.

All proposed water mains, sewer mains, water meters, water services, sewer services, valves, hydrants, sewer manholes, lift stations and other appurtenances are to be clearly represented on the plans.

All water and sewer mains shall include plan and profile sheets with the plan and profile on the same sheet.

I. Engineering work, including plan and profile sheets, shall be sealed and dated by a Professional Engineer licensed in the State of Arkansas and in compliance with the requirements of the Arkansas Board of Licensure for Professional Engineers.

1.07 EASEMENTS

A. The Owners of the project are responsible for acquiring and recording all easements and giving all notices necessary and incidental to the work.

1.08 UTILITY COORDINATION

A. The plans shall show the location of existing overhead and underground utility lines, existing water and sewer lines and the proposed water and/or sewer improvements according to the best information presented and available.

B. It is the responsibility of the Owner or his authorized representative to coordinate with and get approval from the various UTILITIES, including other Departments of the City. Further, it is the responsibility of the Owner to get authorization to encroach upon any other utilities' easement(s) and secure such recorded encroachment as a requirement for dedication of the water and/or sewer lines and system.

C. It is the responsibility of the owner or his authorized representative to comply with the "Arkansas Underground Facilities Damage Prevention Act".

1.09 PUBLIC TRAVEL

A. When requested by the City, and project specific, the Engineer will provide a maintenance of traffic plan for City review and approval.

B. The contractor will plan and execute the work to assure minimal interference with normal flow of traffic and pedestrians.

C. The contractor will be reasonable for making provisions for the safe and free passage of persons and vehicles over or around the construction site, both during and after working hours. Such provisions will be satisfactory to the City, County or State authority having jurisdiction within the work area.

D. The contractor will notify and obtain applicable approvals and permits from City, County or State authorities before closing or obstructing any public highway, street, road, trail or sidewalk.

E. The contractor will provide and maintain necessary barricades, signs, lights, roadway trench covering, fencing, personal safety equipment and markers around or at the construction area to avoid any property damage or personal injury. The contractor will provide qualified flagmen to direct traffic while working upon or in a highway, street or road over which traffic must pass.

F. Excavated area within traffic lanes of highways, streets, roads, trails and walks will be backfilled with compacted class 7 aggregate base course immediately following pipe installation and the area opened to traffic. Where indicated or when requested by the City

an additional course of asphalt concrete hot or cold mix will be provided as the travel surface. Excavated areas shall be brought to the adjacent/contiguous paved surface elevations and constantly maintained by the contractor.

1.10 MATERIALS SUBMITTALS

A. Submittals sent to the City shall be in PDF format.

B. The Engineer of Record shall be responsible to review and approve the materials submittal(s) to ensure compliance with these specifications. The City of Fayetteville generally will not review and approve material submittals for private development projects, but will rather check materials in the field to ensure they comply with these specifications.. Once the Engineer of Record has reviewed and approved the material submittals, they shall submit those to the City of Fayetteville where they will be kept on file for reference.

C. Submit the manufacturer's certificate that the products/materials meets the Specification requirements including material testing requirements.

D. Construction procedures other than those outlined in these specifications shall be submitted for review and approval by the City of Fayetteville.

1.11 CONSTRUCTION LAYOUT

A. The layout and staking of the construction work shall be by trained and qualified survey personnel under the supervision of the Engineer. Construction layout shall consist of staking (physical monuments) necessary to determine alignment and elevations to properly construct the proposed facilities. The use of a pipe laser is required for gravity sewer construction.

1.12 INSPECTION, OBSERVATION AND TESTING

A. Comprehensive construction observation services shall be provided by a professional engineer as defined by AR §17-30-101.

B. Only authorized personnel from the City of Fayetteville Water & Sewer Department are permitted to operate valves on the existing water system. Under no circumstance shall the Contractor operate any valve on the existing water system.

C. All field tests and inspections required for a project shall be witnessed by the City in the presence of the Engineer of Record or their authorized representative and the Contractor. Water Testing is further defined in Section 5300. The tests required for sewer lines, manholes and service lines are further specified in Section 5200. The tests for pump stations will be determined for each project based upon the final design and Section 3500.

On a case by cases bases for work after hours (or other similar circumstances), the City Engineer or Utility Engineer may authorize testing without city personnel when the Engineer of Record or their authorized representative is present.

D. The City representative will be determined at, or prior to, the pre-construction meeting.

E. In no case shall a test be made without the presence of the Engineer of Record's representative and the Contractor. It is the responsibility of the Engineer of Record and/or the Contractor to coordinate the scheduling of tests with the City and with the other parties involved.

F. All equipment, materials, and labor required for testing shall be furnished by the Contractor at his expense.

G. Generally, no Contractor or Engineer of Record involvement is required in the taking of samples for the Bac-T test except that the Contractor is responsible for the proper flushing of the line prior to samples being taken by the City. However, the City may require the presence of the Contractor or Engineer of Record when questions have been raised as to the methodology or techniques used in the sampling process.

H. Bac-T samples are sent to the Arkansas Department of Health for testing. Results are available on-line at the ADH website. Results obtained by the City may be forwarded to the Engineer of Record either by email, fax, or mail upon request of the contractor.

I. Lines failing the Bac-T tests shall be re-sampled as soon as practicable. If a line fails two (2) consecutive Bac-T tests, the line must be re-chlorinated before Bac-T samples can be taken again. The City shall not be responsible for rescheduling Bac-T tests.

J. The fire hydrant test shall consist of checking the operation of the fire hydrant valve and flowing the fire hydrant. This test will be performed jointly by Contractor and City forces. This test will be done after the pressure test has been completed. The fire hydrant valve shall be left in the open position during the test and after the test is completed.

1.13 "AS-BUILT" or "RECORD DRAWINGS"

Upon completion of the project, the Engineer shall provide to City Engineering for record purposes "as-built" or "record drawings". The minimum requirements include:

A. <u>DATUM REQUIREMENTS</u>

1. Horizontal Datum: NAD83 (1986) Arkansas State Plane, North Zone, US foot (Grid System).
2. Vertical Datum: NAVD88 (feet)

B. <u>TOLERANCES</u>

1. Horizontal: +/- 0.5 feet
2. Vertical: +/- 0.05 feet

C. Water drawings submitted as record ("as-built") drawings shall indicate the location where the water line was installed and have the following items surveyed during/after construction and shown on the drawings:

1. Fire hydrant, location and top operating nut elevation
2. Water valves, location
3. Water fittings, location
4. Water service saddle, location
5. Water service saddles used for testing, location
6. Water meters, location
7. Tapping sleeves, location
8. Any other pipe penetrations, location
9. Steel encasements, location
10. Details shall be provided for all vertical offset water lines, profile drawing

D. Manufacturing data shall be collected for pipe, valves, and hydrants as follows:

1. Pipe
   a. Manufacturer
   b. Material: DI, PVC or other – specify.
   c. Diameter
   d. Production run code or lot code
   e. DR or Thickness class
   f. Pressure class
2. Valves
   a. Manufacturer
   b. Model number
   c. Year manufactured
   d. Type (gate, butterfly, ball, etc.)
   e. Diameter
3. Hydrants
   a. Manufacturer
   b. Model number
   c. Year manufactured
   d. Depth of bury, including extensions

E. Sanitary sewer drawings submitted as record ("as-built") drawings shall indicate the location where the sewer line was installed and have the following items surveyed during/after construction and shown on the drawings:

1. Manholes, location and rim elevation
2. Pipe material, diameter, and invert elevations
3. Sewer main percent slope (calculated and setting from pipe laser)
4. Lateral connections. Lateral measurements shall be indicated by their distance from the downstream manhole in the form of stationing. Lateral stationing shall begin at 0+00 at each downstream manhole.
5. Location of capped service lines

6. Cleanouts (if installed during construction)
7. Location of fittings, valves, and valve boxes on force mains
8. Location of steel encasements
9. CCTV video (Digital Media format, USB drive preferred) and logs shall be delivered to the City of Fayetteville.

F. All sheets shall have the phrase "as-built" or "record drawing" boldly printed on them with the as constructed date, and shall be stamped and signed by a professional engineer registered in the State of Arkansas. Record drawings shall be submitted in hard copy, .dwg electronic format, and .pdf electronic format.

1.14 FINAL ACCEPTANCE BY THE CITY

A. The City will be deemed to have accepted water and sewer lines and appurtenances for ownership upon completion of the following.

1. Acceptable physical site Final Inspection by the following:
    a. A representative of the City Engineer's Office
    b. A representative of the Fayetteville Water and Sewer Department
    c. The Engineer of Record
    d. The Contractor

2. Acceptable walk-through by the Meter Foreman for location, grade, and condition of water meter settings
3. Acceptable walk-through by the City representative for all other items of water or sewer construction.
4. Construction Cost is received by the City and subsequently approved in writing.
5. Maintenance Bond is received by the City
6. Record Drawings are received by the City
7. Engineer of Record Certification is received by the City.
8. Contractor furnished statement of estimated water quantity used during construction, testing, flushing and final acceptance, total gallons.
9. The Engineer of Record shall provide to the Utilities engineer and copy to the City engineer a sealed (PE) letter report stating that the design and construction of the water and/or sewer improvements met the minimum requirements of these Specifications including certification that the project was constructed in accordance with the engineering plans and specifications as approved by the Arkansas Department of Health. This sealed letter report will also contain documentation of any special conditions or additions to these Specifications for the specific project.
10. Letter of Final Acceptance is provided by the City to the Engineer.

B. No water meter shall be set until all final acceptance requirements are met and the line is accepted by the City.

C. No sewer shall be utilized until all final acceptance requirements are met and the line is accepted by the City.

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END OF SECTION 1000

SECTION 2001 DESIGN STANDARDS - WATER

PART 1 – GENERAL

1.01 WATER LINE (MAIN) MATERIALS

A. Unless specified or detailed otherwise, materials for water line mains up to and including 12 inch diameter shall be PVC as further specified within these Standard Specifications. Ten (10) inch diameter pipe is not permitted for water mains.

B. Ductile iron pipe (DIP) shall be used for all pipe greater than 12-inches in diameter and as further specified within these Standard Specifications.

C. Unless requested otherwise by the City's designated engineer, all fire hydrant leads shall be of the same pipe material as the attached water main as recommended in AWWA M17 latest edition.

D. All buried iron pipe, valves, and fittings shall be double poly wrapped in accordance with these Standard Specifications.

E. Polyethylene (PE) pressure pipe is not permitted as publically (City) maintained water main or water service lines.

F. Pipe and fittings for nominal pipe diameters/sizes greater than 18-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

G. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification. Work for, on or connecting to the City's PCCP will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 REQUIREMENTS TO EXTEND WATER SERVICE

A. Unless approved otherwise by City Council, new developments and/or water extensions to serve existing lots, are required to extend water service to that development at the owner's expense in accordance with City Ordinance Chapter 51: Water and Sewers. Water lines shall be extended to each property to be served by City of Fayetteville water. Water service shall include providing adequate domestic water flows as well as fire protection with hydrants spaced in accordance with the local and state fire codes.

City Council approved cost share projects, including defined infill projects, may be further considered in accordance with City Council guidance or policy and paragraph 1.05.

B. Water service lines shall extend perpendicular to the water main and extended to the property

being served where an appropriately sized water meter will be installed.

C. On subdivision or large scale development water systems, water lines shall be extended through all the development to the property line so that future development(s) can tie on without disrupting the service to or property of any existing customers or owners. Dead end lines shall be avoided whenever possible.

D. All water lines with dead ends shall be installed with an upstream valve, one full joint of pipe with a MJ restraining gland, concrete anchor collar, a MJ cap with restraint, and a blow off assembly. The seat of the MJ restraining gland on the pipe shall face the valve.

E. Subdivision developments greater than lot splits as defined in UDC Chapter 166: Development will:

a. Connect into the existing water system at a minimum of two locations.

b. Provide water line extensions off of the development property to loop with the existing water distribution system.

The extension and second connection to the water system is required to better maintain water quality and to maintain water service in the event of a water line break in the immediately vicinity. An inline valve shall be installed on the existing water line between the two points of connection if one is not currently installed.

Construction of off-site extensions will be at the expense of the developer, subject to "rough proportionality" as further noted in Chapter 155 of the City of Fayetteville Unified Development Code.

Other developments, including Large Scale Developments, may be required by Planning Commission or City Council to tie to the existing water system at a minimum of two locations and provide off-site water extensions to maintain water quality and maintain water service in the event of a water line break in the immediately vicinity.

F. At other locations easements may be required to facilitate future extension of lines to adjacent properties.

G. The requirements to extend water service and provide lines adequate for both domestic and fire demands shall apply to all subdivisions regardless of whether they are inside the City Limits or not. Where subdivisions are outside the City Limits, the placement of fire hydrants shall be optional and in no case shall hydrants be installed outside the City unless a) a fire flow of at least 500 gallons per minute can be obtained at the hydrant, and b) the residents being served by the hydrant have a contract for fire protection with the City of Fayetteville and/or with a Washington County Rural Fire Department having a mutual aid agreement with the Fayetteville Fire Department.

1.03 MINIMUM SIZE OF WATER LINES

A. The minimum sized water line that may be installed in the water system as a "Water System Improvement" shall be eight (8) inch diameter as defined in Chapter 151 of the City of Fayetteville Unified Development Code. Unless documented and approved otherwise by the City, the minimum size water main installed by development shall be eight (8) inch diameter.

Minimum water line sizes less than eight (8) inch diameter will receive special consideration in situations such as existing areas of six (6) inch water lines. Such special consideration will be based upon engineering calculations for domestic and fire flow demands, existing infrastructure, water modeling, water age and water quality and as follows.

Four (4) inch diameter lines shall be the minimum water line size that may be approved for special conditions such as "short" cul-de-sacs as determined by the City or rural water extensions, provided such lines could not be reasonably extended in the future to provide service to adjacent property and where a larger line is not needed to provide either fire protection or adequate domestic flows.

Two (2) inch domestic water service extensions may be granted by the Utilities Director.

All water lines less than eight (8) inches in diameter require approval from the Utilities Director and subsequently the ADH.

B. The minimum line size requirement for the provision of fire protection shall be based upon fire flow calculations including the flow for the private fire line/sprinklers in addition to the flow required at fire hydrants, water modeling calculations and as follows. The minimum line size requirement for the provision of fire protection shall a looped six (6) inch line or, in the event of a dead end line, an eight (8) inch. This minimum requirement shall apply regardless of the theoretical flow capacities existing in the system. Lines larger than six (6) inch looped and eight (8) inch dead end may be required if larger lines are needed to provide domestic and/or fire flow demands based upon engineering calculations and/or water modeling.

C. The latest Water System Study has recommended a twelve (12) inch water line grid not to exceed a spacing of 1/2 of a mile in both the north-south and east-west direction. In the event that the maximum size water line for a development is less than twelve (12) inches, the City may participate in "cost sharing" for the installation of twelve (12) inch water lines as recommended by the latest Water System Study. The extent of the "cost share" will be for pre-approved and verified installation cost differences. Refer to Paragraph 1.05 – City Participation in Water Line Costs.

1.04 WATER SYSTEM STUDY/MASTER PLAN

A. The City's latest Water System Study (or Master Plan) and current water model will be the primary basis for decisions made in regard to required line sizes, water line locations, location of water pump stations, water tank sizes and location, and any other matter relating to the water distribution system.

1. The latest Water System Study is a published document on file at the City Engineer's Office and at the Utility.

2. The current water model is located at the City's Utility (Water/Sewer).

It is the intent of these Standards that the City Utility, subject to other City and Utility priorities, will provide the modeling of proposed water mains using the City's current software and model. However, there may be specific projects that due to the size or complexity, the Utility's current priorities, or the requirements of a Professional Engineering sealed report, that such projects will require water modeling by the Engineer of Record and review by the City.

B. The Utilities Director and City Engineer have the discretion to alter the published Water System Study (Master Plan) priorities and recommendations based upon current City requirements.

1.05 CITY PARTICIPATION IN WATER LINE COSTS

A. In cases where the City desires to have a larger sized water line in place than is required under Paragraph 1.02 of these Standard Specifications, or in cases where the City desires to extend a water line under Paragraphs 1.02 and 1.03 of these Standard Specifications, in accordance with City Ordinance Chapter 51: Water and Sewers, the City may enter into an agreement with the developer to provide for the construction of the larger sized line, or the extension of the designed water line. City participation in water line costs will be based upon current City Council guidance.

B. Upon City Council or Mayoral approval, the City will be responsible for the pre-approved and verified installation cost difference between the water line required for the development and the water line desired by the City.

C. The cost involved in up-sizing, or extending the water line shall be determined by the developer's engineer by the taking of bids, and shall be approved by the City Engineer or Utilities Director, and then approved by the City Council prior to construction.

1.06 WATER SERVICE LINES

A. Water service connections shall be made on 12-inch and smaller water lines.

B. Service lines serving single meters sets and double meter sets shall be 1- inch coated copper pipe in accordance with these Standard Specifications.

C. In areas where it is determined by the City Engineer that installation of irrigation systems is likely, service lines that cross roads and serve double meter sets shall be 2" services ending in a 2" x 1" x 1" x 1" splitter. The middle leg of the splitter shall feed the double meter set, with the other two legs containing a ball valve, and being intended to serve future irrigation meters. The meter box shall be no greater than two feet from the splitter.

D. Service lines serving 1-1/2 and 2 inch meter sets shall be 2-inch coated copper pipe, or 2-inch restrained joint PVC (main) in accordance with these Standard Specifications.

E. Water services lines installed across city streets shall be encased back of curb to back of curb, or state highway right-of-way to right-of-way. 1-inch lines shall be encased in minimum 2 inch HDPE SDR9 tubing. 2-inch lines shall be encased in minimum 4-inch HDPE SDR9 tubing. Larger diameter encasement tubing will be provided by the contractor as required.

F. Service lines serving 3-inch and larger meter sets shall be PVC or DIP in accordance with these Standard Specifications.

G. Meter arrays for multiple meters fed from a single 2-inch tap shall be made per the standard details. These must be approved on a case-by-case basis, and may be required by the City to reduce the number of taps on a public main.

1.07 WATER METER SIZE

A. Water meters serving flows up to 10 gpm continuous (15 gpm intermittent) shall be 5/8" water meter.

B. Facilities that use flush valve style (tankless) toilets shall use a minimum 1" water meter.

C. Water meters serving flows up to 25 gpm continuous (40 gpm intermittent) shall be 1" water meter.

D. Water meters serving flows greater than 25 gpm continuous shall be approved by the City of Fayetteville Meter Department during the plan review process.

1. For reference only, meter flow ranges may be as follows:

a.	1-1/2" meter	up to 65 gpm continuous (100 gpm intermittent)
b.	2" meter	up to 150 gpm continuous (200 gpm intermittent)
c.	3" meter	up to 350 gpm continuous (500 gpm intermittent)
d.	4" meter	up to 800 gpm continuous (1000 gpm intermittent)

1.08 BACKFLOW PREVENTION

A. The City of Fayetteville water distribution system shall be protected from the possibility of backflow by the use of a reduced-pressure principal backflow prevention assembly (RP), a double check valve assembly (DC), or an air gap in accordance with the City Ordinance 51.146 Backflow Prevention and the Arkansas State Plumbing Code (ASPC), latest edition.

B. The City of Fayetteville Utilities shall review and sign off on all proposed backflow prevention installations.

1.09 EASEMENTS

A. For water lines that are up to 10 feet deep, easements shall be at least 20 feet in width with the water line in the center of the easement. For water lines that are greater than 10 feet deep, easements shall be 1 foot per foot of depth to the bottom of the pipe on each side of the water

line.

B. Lines sized 12-inches through 18-inches shall not be placed in easements of less than 25 feet. Lines larger than 18-inches shall be placed in an easement of no less than 30 feet. Wider easements may be required, depending on the specific circumstances involved.

C. Easements for 12-inch and smaller lines may be exclusive or general utility. Any line above 12-inches in diameter must be an exclusive water/sewer easement unless approved otherwise by the Utilities Division.

D. New developments that contain existing water lines must modify the existing easements as necessary to meet the above requirements for widths in relation to pipe location and size, including increasing the size of the easement if proposed fill will cause the depth of bury to exceed ten feet.

E. Easements of a lesser width will be considered when adjacent to another easement or under other special circumstances.

1.10 LOCATION OF WATER LINES

A. Water lines shall be placed on public streets either in the right of way or in an easement adjacent to the street right of way except that lines can go between lots when there is no other reasonable way to access a line or provide for future service. In no case shall lines intended for individual services be placed in the rear of lots or along back property lines.

B. When not adjacent to right of way or other easements, waterlines shall be centered in the easement.

C. Water lines shall be located a minimum of 36-inches from any other parallel utilities or structures.

D. Trees shall not be planted within 5-feet of any waterline, water service line, meter, valve, hydrant or water system appurtenance. Larger waterlines may require further separation.

E. Water lines shall be offset 10-feet from any buildings, structures, overhangs, balconies, etc. If an easement of more than 20-feet is warranted due to depth or diameter, the building offset shall increase accordingly, to half the easement width.

1.11 LOCATION OF WATER METERS

A. Water meters shall be located in non-paved areas and readily accessible to the Meter Department without going through fences or gates.

B. Water meters shall be free of obstructions for a minimum of a 3-foot radius from the center of the water meter box.

C. Water meters shall typically be located on the Owner’s side of the property line (edge of

easement or right-of-way). If a water meter cannot feasibly be located 1-foot behind sidewalk as per standard details, meter location must be approved in advance of construction. Otherwise, the meter must be relocated at the developers' expense to the proper location. Consideration for meters between curb and sidewalk (in greenspace) will be made on a case-by-case basis at the discretion of the City.

D. Double meter sets shall be located on the common property line between the two properties being served.

E. Where multiple meters serve units of a common building, the meters must be set to read left-to-right in ascending unit numbers, with irrigation meters placed at the end, in a single yoke.

1.12 VALVE MARKERS

A. In all rural settings and where requested by the City, except those in cleaned yards, when valve boxes, bends, air release valves, blow-offs, meter boxes and other similar hardware are installed in an easement location, water system marker signs shall be installed so that the items may be more easily found.

1.13 WATER LINE DEPTH

A. Minimum depth to the top of pipe for all water main lines less than 12- inches diameter shall be 3.0 feet.

B. Minimum depth to the top of pipe for water lines 12 - inch diameter and greater shall be 4.0 feet.

C Maximum water line cover shall be 5.0 feet under normal conditions. Cover greater than 5.0 feet shall be allowed for short distances where required by field conditions and approved by the City.

D. Minimum depth of all water service lines from the main to the water meter shall be 30-inches.

1.14 WATER PRESSURE

A. The water distribution system shall be designed to maintain a minimum working water pressure of 45 psi at the water meter.

B. Design of new construction that results in less than 45 psi working pressure at the water meter shall be approved by the Utilities Director on a case by case basis.

C. Under no circumstances shall the working pressure of the water distribution system be below 20 psi.

D. When new development extends public mains in excess of 150-psi static pressure, the City reserves the right to require additional valving and easements to accommodate pressure reduction vaults and appurtenances in the future. On dead-end extensions, pressure reducing

mainline valves may be required, properly constructed in a vault, to be reviewed on a case-by-case basis.

1.15 VELOCITIES

A. Velocities in the water distribution system shall be designed such that velocities will be no greater than five (5) feet per second during normal operation conditions.

B. Velocities in the water distribution system during fire flow conditions shall be designed not to exceed ten (10) feet per second.

1.16 VALVES

A. Valves for 4-inch through 8-inch water distribution shall be resilient seat gate valves. Ten (10) inch diameter pipe is not permitted for water mains.

B. Valves 12-inch and larger shall be butterfly valves.

C. Valve spacing in the water distribution system shall not exceed 500 feet in commercial districts and not more than one block or 800 feet intervals in other districts.

D. Valves at "tees" shall be provided to isolate water mains for maintenance or repairs and to limit outages. Valves may be required on multiple legs of tees as designed by the Engineer of Record and approved by the designated City engineer.

E. Valves shall also be located on each side of stream crossing as determined by the designated City engineer.

1.17 90 DEGREE BENDS

A. Ninety degree (90°) bends shall only be used on a by-exception basis, and must each be specifically approved by the City. Forty-five degree (45°) bends separated by a twenty-four (24) inch swivel adapter shall be used in locations where 90° bends would otherwise be considered.

1.18 FIRE FLOW DESIGN

A. Fire flow design for single family dwellings and duplexes shall be 1,500 gpm for a duration of two (2) hours or as determined and documented by the City's Fire Chief.

B. Fire flow design for apartment complexes, commercial structures, and industrial structures shall be as required by the International Fire Code latest edition, or as determined and documented by the City's Fire Chief.

1.19 FIRE HYDRANT SPACING AND PLACEMENT

A. Fire hydrants for single family dwellings and duplexes shall be installed so that (1) the distance

between two consecutive fire hydrants does not exceed 500 feet, and (2) no lot is more than 250 feet from a fire hydrant. The Fire Chief shall have the authority to require additional fire hydrants upon a determination that such additional fire hydrants are necessary to provide adequate fire protection as outlined in the International Fire Code, latest edition.

B. Fire hydrants in areas for apartment complexes, commercial structures, and industrial structures shall be installed so that the distance between two consecutive fire hydrants does not exceed 400 feet. The Fire Chief shall have the authority to require additional fire hydrants upon a determination that such additional fire hydrants are necessary to provide adequate fire protection as outlined in the International Fire Code, latest edition.

C. Fire hydrants shall be free of obstructions for a minimum of a 3-foot radius from the center of the fire hydrant. Fire hydrants shall be placed outside of any fence.

1.20 FIRE LINES

A. Fire lines, backflow prevention, and FDC shall be installed and inspected the same as water lines.

B. Fire lines shall be constructed of ductile iron pipe or C900 PVC .

C. All valves on fire lines shall have the word "FIRE" on the valve box lid, this includes the valve on the water main.

D. Post Indicator Valves, or underground valves in a roadway box, as determined by the Fire Chief or the City Engineer in compliance with NFPA 24 and City ordinances, shall be installed on all fire lines to demarcate ownership. Post indicator valves shall match the valve manufacturer.

1.21 AIR RELEASE VALVES

A. Air release valves shall be required on uphill, dead-end lines or on other specific applications to protect the water distribution system at the discretion of the City.

1.22 STEEL ENCASEMENTS

A. Water lines under culverts, creeks, concrete channels, retaining walls, or other difficult and/or dangerous to maintain areas shall be encased in a smooth steel encasement pipe. The steel encasement shall extend 5 feet either side of the area.

B. Water lines through steel encasement shall be installed with three spacers per joint such that the spacers are equally spaced along the length of the pipe.

C. Bell restraints shall be used for all joints inside the encasement pipe and for the first joint in each direction outside the encasement pipe.

D. End Seals shall be used on all encasement pipes.

E. Restrained and blocked ductile iron water pipe or restrained and blocked C900 PVC will be used in situations where fittings are required on either side of the steel encasement to change direction or overcome varying field conditions. Additional joint restraints and the use of anchor collars shall be designed by the Engineer of Record and submitted to the City for review.

1.23 PLANNED WATER OUTAGES

A. Under no circumstances shall water be shut off to any active service in the course of new construction without written permission from the City of Fayetteville Water & Sewer Department. If water pressure needs to be reduced to facilitate construction, a preconstruction meeting shall be held. The work shall be performed as described in Section 4200 – Water Line Pressure Reduction Procedures.

1.24 PROTECTION OF WATER SUPPLIES

A. Only authorized personnel from the City of Fayetteville Water & Sewer Department are permitted to operate valves on the existing water system.

B. There shall be no physical connections between a public or private water supply system and a sanitary sewer or appurtenances thereto which would permit the passage of any polluted water into the potable supply. Sanitary sewers shall be laid at least ten (10) feet horizontally from any existing or proposed water line. The distance shall be measured edge to edge of pipes and where applicable to the outside of any appurtenances such as fire hydrants or sewer manholes. In cases where it is not practical to maintain a ten (10) foot separation, the appropriate reviewing agency may allow an exception on a case-by-case basis if supported by data from the design engineer. Such exception may allow installation of the sewer closer to a water main provided that the design and construction meets the more stringent requirements of the ADH Rules Pertaining to Public Water Systems, Ten States Standards and City of Fayetteville requirements which may include full encasement of the water main, and special trench, fill and drainage requirements.

C. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

D. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

E. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. If the water main passes under the sewer main, 18-inches of clearance is still required between pipes. Refer to Section 3400 – Steel Encasement Pipe.

END OF SECTION 2001

SECTION 2002 DESIGN STANDARDS – SEWER

1.01 REQUIREMENTS TO EXTEND SEWER SERVICE

A. Unless approved otherwise by City Council, new developments and/or sewer extensions to serve existing lots, are required to extend sewer services to that development at the owner's expense in accordance with City Ordinance Chapter 51: Water and Sewers.

Sewer lines shall be extended to each property to be served by City of Fayetteville sewer. Sewer service lines shall extend perpendicular to the sewer main and extended to the property being served. Sewer service lines will not cross property lines.

City Council approved cost share projects, including defined infill projects, and/or oversizing of mains, may be further considered in accordance with City Council guidance or policy and similar to Section 1100 paragraph 1.05 in accordance with City Ordinance Chapter 51: Water and Sewers, or as requested by the City Council.

Construction of off-site extensions will be at the expense of the developer, subject to "rough proportionality" as further noted in Chapter 155 of the City of Fayetteville Unified Development Code.

B. Connection to a public sewer system shall be as required, or permitted, by City of Fayetteville Ordinances and ADH Rules Pertaining to Public Water Systems.

1.02 DESIGN CRITERIA

A. GENERAL

All sanitary sewers shall be designed to carry the estimated flow from the area ultimately contributing to the respective reach of the sanitary sewer. The required capacity shall either be established by the City or at the City's option by means of a basin study developed by the Owner or his authorized engineer/designer. In no instance shall a gravity sewer, other than a building sewer, be less than eight (8) inches in diameter.

The following design standards for gravity sewers within or contributing to the City of Fayetteville Sanitary Sewer System have been established:

1. Population Density

Population density shall be in accordance with the Comprehensive Plan for Fayetteville projected by the Division of Planning for the City of Fayetteville or actual count or character of proposed development, whichever is greatest.

2. Average Family

For the purposes of design the average family unit is considered to be 3.0 persons per single family home.

3. Design Flow

The design of all sanitary sewer facilities shall be based on future area population growth and land development characteristics and figures provided by the Department of Planning including the servicing of existing contiguous developed areas not currently served by sanitary sewers. The values of Average and Peak Flow and Design Population hereby shall be the values which include the future flows and population. The City reserves the right to review and determine the appropriateness and/or applicability of the estimated flow volumes provided.

The following shall be used as a guide:

a. Average Design Flows:

1) Single Family Residential: The average design flow for single family dwellings shall be one hundred (100) gallons per person per day.

2) Multifamily/Commercial/Industrial/Institutional: Based upon Table 1 Section 2002-1.10 within these specifications unless modified by technical information either submitted by the Owner and approved by the City, or developed by the City. These flow volume guidelines may be modified at the City's discretion as project location specific.

b. Peak Design Flow

1) Single Family and Multifamily Residential: The peak design flow for a single family development shall be calculated as follows:

$$PeakFlow = (Avg.Flow)\left[\frac{18+\sqrt{P}}{4+\sqrt{P}}\right]$$

Where P is equal to the total Design Population in thousands.

2) Commercial/Industrial/Institutional: The peak design flow from commercial, industrial or institutional developments shall be the average daily flow determined multiplied by 2.5. The peak design flow shall not be less than 90% of the peak water demand or exceed the flow limits of the water meter supplying the facility.

c. Inflow and Infiltration

1) When requested by the City, the design engineer will also utilize current City Masterplan(s) and/or SSES Studies.

4. Design Capacities: Collector and trunk sewers shall be designed on the following basis:

a. Collector Sewers Twelve (12) Inches and Smaller

Peak design flow capacities shall be based on sewers flowing two-thirds (2/3) full based on depth.

b. Trunk Sewers Fifteen (15) Inches and Larger

Peak design flow capacities for trunk or interceptor sewers shall be based on sewers flowing 90% full based on depth, without head, using the design population density and appropriate land use determined by the Division of Planning; and shall include an allowance for infiltration which will be reviewed on a case-by-case basis and is subject to the approval of the City.

B. SEWER COMPREHENSIVE STUDY REQUIREMENTS

A study/engineering report of the applicable sewerage drainage basin(s) is required. This study may include in addition to the proposed project or development, the upstream and downstream basins and existing or proposed lift/pump stations. The size and location of the project will determine the information required in the study/engineering report for the proposed project.

If requested by the designated City Engineer, the Engineer of Record (EOR) shall provide a detailed analysis and PE sealed report including:

The proposed design

The effects of the proposed project, and coordination with any required improvements, to existing sewer facilities including pipe lines and existing or proposed lift/pump stations.

The designated City engineer shall coordinate between the EOR and the City's waste water operations contractor.

Other as determined by the designated City engineer.

C. USE OF CITY SEWER MODEL

In lieu of the aforementioned calculations, the developer or engineer may consult directly with the City's contract engineer to analyze the development and downstream capacities/impacts using the hydraulic model of the City's sewerage system. A stamped technical memo from the City's contract engineer shall be provided to the City for review and acceptance. The City reserves the right to require either methodology and is not bound by the findings or recommendations of this sewer modelling exercise. Furthermore, the City may require that the hydraulic model be utilized due to the complexities of a particular sewer basin in question.

1.03 MINIMUM PIPE SIZES AND STANDARDS

A. PIPE DIAMETER

1. The required diameter of gravity sewers shall be determined by Manning's formula using a roughness coefficient, "n" of 0.013 or the pipe manufacturer's recommendation, whichever is greater. The minimum pipe diameter for gravity sewers lines shall be eight (8) inches.

B. MINIMUM SLOPES AND VELOCITIES

1. All sanitary collector and trunk sewers shall be designed and constructed to provide a minimum velocity when flowing full of two (2) feet per second. The slope of the sewer pipe shall be such that these minimum velocity requirements are attained. The minimum acceptable slopes for the design and construction of sanitary sewers are as follows:

2. THESE ARE MINIMUM SLOPES REQUIRED OF THE DESIGN. AS CONSTRUCTED SANITARY SEWERS FOUND TO HAVE LESS THAN THIS MINIMUM SLOPE SHALL NOT BE ACCEPTED.

Pipe Size* (inches)	Minimum Slope** (Feet per 100 Feet, %)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12

*4" and 6" lines are allowed for building sewers only (services).
** Minimum pipe slopes for diameters 8 inch through 18 inch are based upon the

Ten States Standards 2014 Edition of the Recommended Standards for Wastewater Facilities.

** Slopes for pipe diameters greater than 18 inch require specific City approvals.

C. MINIMUM DEPTH

1. For the protection of the sanitary sewer lines from damage caused by utilities installed after the sanitary sewer has been constructed, the minimum depth to crown of all gravity sanitary sewers shall be 3.0 feet, and the minimum depth to crown of all force main sanitary sewers shall be 3.0 feet.

D. BUILDING SEWERS

1. Building sewers shall conform to the latest edition of the Uniform Plumbing Code, the requirements of the City's Building Safety Division and to these Standards.

2. The building sewer shall connect to the public sewer at a mainline fitting. Sewer service connections shall be made on 12-inch and smaller sewer lines. Connections to manholes shall only be allowed at upstream terminating manholes or by approval of the City. Inside drop connections to manholes are not allowed.

3. Building sewers requiring a 6-inch or larger sewer connection shall be connected at a manhole. If an existing manhole is not available, a new manhole must be constructed.

4. Homes or buildings where the lowest elevation to have gravity sewer service is less than 1 foot above the cover of either the first upstream or downstream manhole on the sewer main shall have a cleanout with a pop-up type, non-locking cover at an elevation no less than 6-inches below the lowest sanitary facility in the structure.

5. Homes or buildings with a slope from the lowest sanitary facility to the public sewer main less than 1 percent shall be served with a pump system. The system shall be purchased, installed, and maintained by the owner.

6. Building sewers within the right-of-way or easement shall be a minimum of four (4) inches in diameter. Building sewers shall have a wye cleanout located within three (3) feet of the building's exterior wall and extended to 3-inches above grade and shall have a watertight, removable cap.

7. Cleanouts installed under concrete or asphalt paving shall be made accessible by a short bodied cast iron valve box.

8. If cleanouts are determined during city review or construction to pose a risk of damage due to location or grade, the city may require on a case-by-case basis the use of a protective shroud cone housing and post indicator. Product shall be Utility Defender or approved equal.

9. Building sewers installed for future connections shall be terminated at the right-of-way or easement and plugged to ensure 100 percent water tightness. Mark wyes for future connections using marking tape, tracer wire, yellow nylon rope, and 1/2" x 4' rebar or fence tee-post.

1.04 SEWER LINE MATERIALS

A. Materials for sewer line mains shall be PVC unless approved otherwise by the City of Fayetteville or otherwise indicated in these specifications.

1.05 LOCATION OF SEWER LINES

A. Sewer lines shall be placed on public streets either in the right of way or in an easement adjacent to the street right of way except that lines can go between lots when there is no other reasonable way to access a line or provide for future service. Sewer lines located in easements behind houses without a dedicated, paved alley shall have the manholes located adjacent to the nearest street right-of-way.

B. When not adjacent to right of way or other easements, sewer lines shall be centered in the easement.

C. Sewer lines shall be located a minimum of 36-inches from any other parallel utilities or structures.

D. Trees shall not be planted within 5-feet of any sewer line, sewer service line, or sewer system appurtenance. Larger sewerlines may require further separation.

E. Sewer lines shall be offset 10-feet from any buildings, structures, overhangs, balconies, etc. If an easement of more than 20-feet is warranted due to depth or diameter, the building offset shall increase accordingly, to half the easement width.

F. Easements for 12-inch and smaller lines may be exclusive or general utility. Any line above 12-inches in diameter must be an exclusive water/sewer easement unless approved otherwise by the Utilities Division.

1.06 SEWER STRUCTURES

A. <u>MANHOLES</u>

1. General

a. Manholes shall be installed at the end of each line; at all changes in grade, size, materials or alignment; at all sewer intersections and at the following intervals:

Pipe Diameter (inches)	Maximum Interval Between Manholes (feet)
8 to 18	400

b. Manholes shall be located such that they are readily accessible to sewer cleaning equipment. Access drives will be provided as required by the City of Fayetteville. Access drives will be a minimum 10' wide all weather drive surface designed for maintenance truck traffic. 10' wide double gates shall be provided for all fences where manhole access is required. Sewer mains located in easements behind houses without a dedicated, paved alley shall have the manholes located adjacent to the nearest street right-of-way.

c. The minimum inside diameter of manholes shall be as stated in Section 3300-Manholes.

d. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineer's Standard Details.

e. At changes in sewer alignment and/or sizes, the energy gradient elevation shall not increase. This shall be accomplished by keeping the crown elevation continuous where possible for changes in sewer sizes.

f. Connections to manholes on trunk sewer lines shall be installed at such elevations that will not cause a backup in the collector sewer. Trunk sewers are designed to flow completely full during peak operation. Therefore, connections should not be made below the crown of the trunk sewer line pipe.

g. Minimum drop across the manhole from inlet invert to outlet invert for size on size pipes shall be 0.10' for 0 up to 45 degree change in direction, and 0.20' for 45 to 90 degree change in direction.

h. Manholes proposed to be installed in unpaved areas shall be designed and constructed such that the top of the casting is a minimum of three (3) inches and a maximum of five (5) inches above the finished grade to prevent ponding of water over the casting. Positive drainage away from the manhole shall be provided.

i. Manholes constructed within a 100-yr floodplain shall be constructed such that the rim elevation is a minimum of 2-feet above the flood elevation or be constructed with hinged and gasketed covers. Manholes that are within the 100-yr floodplain and also within the ROW shall have hinged and gasketed covers.

j. Manholes located on 15-inch and larger sewer lines or manholes on sewer lines

within 100 feet of a 15-inch and larger sewer line shall be epoxy coated on the interior. Capital Improvement Projects shall be a separate pay item for epoxy coating or lining as further defined in the subsequent measurement and payment specifications prepared by the Engineer of Record.

k. If requested by the City, manholes shall be provided with composite (non-metallic) ring and lid to avoid corrosion. Exact product must be reviewed and approved prior to installation, on a case-by-case basis. Lid must be capable of locking shut and have metal tracing element.

2. Outside Drop Connections

a. Outside drop pipe connections shall be provided for all sanitary sewers entering a manhole at an elevation greater than twenty-four (24) inches above the invert of the manhole.

b. In areas where future residential, commercial, and/or industrial growth can occur, all new manholes 15 feet deep or deeper shall be equipped with up to two (2) outside drop connections of a size and at an elevation to be determined by the City at the time of design to allow for future connections at these points. The drops shall extend from the base to within 10 feet of the final graded surface elevation.

NOTE: THIS SHOULD NOT IMPLY THAT EVERY MANHOLE SHALL BE PROVIDED WITH 2 OUTSIDE DROP CONNECTIONS.

B. SEWER PUMP STATIONS

1. A construction permit shall not be issued for a sanitary sewer pump station until an economic analysis proves to the satisfaction of the City that the pump station exhibits a lower 20-year life cycle cost than extending a gravity sewer to the development.

2. The analysis shall be per latest standard practice for least cost (life cycle) as developed by ASTM C1131 and evaluate labor costs, maintenance costs (including parts replacements), operation costs and rehabilitation costs. The analysis shall take into consideration both interest and inflation rates.

3. The following minimum assumptions shall be made when calculating life cycle costs.

a. Pump Station Construction Costs = Actual cost
b. SCADA System = $7,500 in 2017 and is subject to annual revision by the Utilities Director
c. Pump Station Routine O&M labor = 50 hrs/year @ $40/hr
d. Effective Energy Costs = $0.25/kW·hr
e. Interest Rate = 5%
f. Inflation Rate = 3%

g. Replace pumps in year 11

4. In the event that a pump station is more cost effective than gravity sewer, the operation and maintenance expenses for the pump station must be paid in addition to the monthly sewer service charges paid by the benefiting customers. The estimated service life shall be 20 years.

5. If a pump station is more cost effective, the City of Fayetteville reserves the right to cost share with the developer to pay for a gravity sewer extension in lieu of a pump station.

1.07 EASEMENTS

A. GENERAL

1. Whenever possible, sanitary sewers shall be constructed within the public right-of-way. Should the construction be outside the limits of the public right-of-way, recorded sewer easements shall be acquired, dedicated and recorded solely for the benefit of the City. Easement boundaries shall be so shown on the plans and specifications as "Water and Sewer Easement" in lieu of "Utility Easement". Sanitary sewers may be constructed within "platted" utility easements if the work is performed in conjunction with a development approved by the City.

2. The minimum permanent easement widths to be dedicated to the City are as follows:

Depth of Sewer from Finished Grade	Easement (ft)
up to 10 feet	20
> 10 feet to 20 feet	25
greater than 20 feet	30

3. All sanitary sewers shall be centered in the easement. For those sanitary sewers constructed in the public right-of-way, the easement shall extend the distance outside the right-of-way necessary to provide the required easement width. Sewers not centered in the easements shall have an easement width equal to 1/2 that designated above on each side of the easement.

4. A minimum 50 foot by 50 foot deeded property shall be provided for all submersible lift stations with wet wells up to 20 feet deep. Deeds for lift stations with wet wells greater than 20 foot deep and/or wet well/dry pit lift stations shall be handled on a case by case basis.

5. The sewer easements shall be exclusively under the discretion and control of the City. Ingress and egress shall be available to the City's crews at all times. No utility companies are allowed to use the sewer easements for installation of their utility lines without the expressed written permission of the City. All plan sheets shall clearly identify the sanitary sewer easement and the location of all other proposed utilities.

The horizontal and vertical plans shall identify all utilities proposed to cross the sanitary sewer easement.

1.08 PROTECTION OF WATER SUPPLIES

A. Comply with Section 2001 1.24.

1.09 STEEL ENCASEMENTS

A. For maintenance purposes, sanitary sewers will be encased in steel encasement pipe wherever the sanitary sewer crosses significant utilities, significant drainage way(s), or other significant obstacles as determined by the design provided by the Engineer of Record or as requested by the designated City engineer.

B. Sewer lines through steel encasement shall be installed with three spacers per joint such that the spacers are equally spaced along the length of the pipe.

C. Bell restraints shall be used for all joints inside the encasement pipe and for the first joint in each direction outside the encasement pipe.

D. End Seals shall be used on all encasement pipes. Refer to Section 3400 – Steel Encasement Pipe.

E. Force mains shall also include joint restraints, blocking and the use of anchor collars as designed by the Engineer of Record and submitted to the City for review.

1.10 TABLE 1 MINIMUM DESIGN FLOWS

Multifamily/Commercial/Industrial/Institutional:

	Type of Establishment*	Gallons Per Person of Wastewater Per Day Unless Otherwise Noted
1.	Institutions other than hospitals	180 – 120
2.	Schools (without gym and showers)	15
3.	Schools (with gyms and showers)	25
4.	Organization camps only	
	a. With showers and handwashing facilities	20 +
	b. With toilets, showers and handwashing facilities	40 +
	+ Cooking or central food service included.	
5.	Campgrounds	
	a. With individual sewer connections (per site)	100
	b. With community building only (per site)	50
6.	Mobile home parks (per mobile home park space)	200
7.	Motels and hotels (per room)	100
8.	Restaurants along an interstate or major highway; 24-hour operation (per seat)	70
9.	Restaurants; 24-hour operation (per seat)	50
10.	Restaurants; less than 24-hour operation (per seat)	35
11.	Bars and cocktail lounges (per seat)	35
12.	Bowling alleys (per alley)	100
13.	Places of employment (does not include industrial waste, per employee per shift)	15-35
14.	Day workers at offices	15
15.	Picnic parks and areas	5
16.	Drive-in theaters (per ramp parking space)	7
17.	Service stations (per vehicle served)	10

	Type of Establishment*	Gallons Per Person of Wastewater Per Day Unless Otherwise Noted
18.	Swimming pool bathhouse (per person)	10
19.	Private dwelling (per dwelling)	300
20.	Apartments	
	a. One bedroom (per apartment)	200
	b. Two bedroom or more (per bedroom)	150
21.	Shopping center (where stores are not known) per square foot building area	0.45
22.	Churches	
	a. Without kitchen (per sanctuary seat)	3
	b. With kitchen (per sanctuary seat)	5
23.	Beauty salon	35
24.	Day care center	20

* The flows listed indicate a reasonable approach for the type of establishment referenced. Additional considerations, including the ADH Rules and Regulations pertaining to Onsite Wastewater Systems Appendix B or other applicable technical data will be necessary in some cases.

Source: Section 1200 of the "Standard Specifications for Design and Construction of Water Lines and Sewer Lines, 2012 Edition"

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END OF SECTION 2002

SECTION 2003 TRENCH SAFETY/PROTECTIVE SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 Safety and Health Regulations for Construction Subpart P, Excavations, Standard 1926.650, of the Code of Federal Regulations and as follows.

B. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

C. If the Contractor is working for any Arkansas public body (state agency, county, municipality, school district, or other local tax unit or improvement district), and has entered into a contact under the provisions of Arkansas Code Title 22. Public Property §§ 22-9-202-204, then the engineer and the contractor shall comply with Arkansas Code Title 22. Public Property § 22-9-212 Public improvements generally - Trench or excavation safety systems.

The requirements include, but are not necessarily not be limited to:

> 22-9-212. Public improvements generally -- Trench or excavation safety systems.
>
> (a) Whenever any agency of this state or of any county, municipality, or school district, or other local taxing unit or improvement district, enters into a contract covered by the provisions of 22-9-202 -- 22-9-204 for the making of repairs or alterations or the erection of buildings or for the making of any other improvements, or for the construction or improvement of highways, roads, streets, sidewalks, curbs, gutters, drainage or sewer projects, or for any other construction project in which the public work or public improvement construction project involves any trench or excavation which equals or exceeds five feet (5') in depth, the agency, county, municipality, school district, local taxing unit, or improvement district shall require:
>
> (1) That the current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, be specifically incorporated into the specifications for the project; and
>
> (2) That the contract bid form include a separate pay item for trench or excavation safety systems to be included in the base bid.
>
> (b) In the event a contractor fails to complete a separate pay item in accordance with the applicable provisions of subsection (a) of this section, the agency, county,

municipality, school district, local taxing unit, or improvement district shall declare that the bid fails to comply fully with the provisions of the specifications and bid documents and will be considered invalid as a nonresponsive bid. The owners of the above-stated project shall notify the Safety Division of the Department of Labor of the award of a contract covered by this section.

The engineer and the contractor are responsible for compliance with the latest version of this Code (Arkansas Code Title 22. Public Property § 22-9-212 Public improvements generally - Trench or excavation safety systems).

D. Protective Systems - The Contractor shall design or provide an engineered design, and shall install, and maintain Protective Systems in strict compliance with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 – Construction, of the Code of Federal Regulations and all other applicable Federal, State, and local requirements.

1.02 29 CFR 1926, SUBPART P, INCORPORATED

A. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, is incorporated by reference into these Standard specifications.

B. Additional information may be found at:

United states Department of Labor, Occupational Safety and Health Administration, Regulations (Standards – 29 CFR) Construction Standard Number 1926 – Safety and Health Regulations for Construction.

https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1926

Trenching and Excavation Safety OSHA 2226-10R 2015 Booklet at:

https://www.osha.gov/Publications/osha2226.pdf

END OF SECTION 2003

SECTION 2004 CONFINED SPACES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1910 Occupational Safety and Health Standards including Subpart J, General Environmental Controls Excavations, Standard 1910, including but not limited to 29 CFR 1910.146, Permit-required Confined Spaces of the Code of Federal Regulations and as follows.

B. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications. The Contractor is responsible to notify OSHA of the commencement of all water or sewer construction.

C. The Contractor is responsible to notify the City Engineer or Utilities Director, and the Engineer, when personnel are to work in, or near, a Permit-Required Confined Space and contractor shall coordinate such work with the City Engineer or Utilities Director, and the Engineer.

D. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of type of Permit-Required Confined Space documentation, permit and program used by the contractor.

E. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of any hazards confronted or created in a Permit-Required Confined Space.

F. The Contractor is responsible to notify the City Engineer or Utilities Director, and the Engineer, when personnel are to work in, or near, a Non-Permit-Required Confined Space and contractor shall coordinate such work with the City Engineer or Utilities Director, and the Engineer.

G. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of type of Non-Permit-Required Confined Space documentation and program used by the contractor.

H. Contractor shall inform the City Engineer or Utilities Director, and the Engineer, of any hazards confronted or created in a Non-Permit-Required Confined Space.

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END OF SECTION 2004

SECTION 2005 PUBLIC EMPLOYEES RIGHT TO KNOW ACT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1910 Occupational Safety and Health Standards including Subpart H, Hazardous Materials, Standard 1910.120, of the Code of Federal Regulations and as follows.

B. Comply with State of Arkansas Act 556 of 1991, Arkansas Code Ann. Sec 8-7-1101 et. Seq.: Public Employees Chemical Right to Know Act, and as follows.

C. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

D. The Contractor shall provide to the City Engineer or Utilities Director, and the Engineer, a list of all hazardous chemicals and a copy of the appropriate Safety Date Sheets (SDS) (previously aka Material Safety Data Sheets) brought onto the property. This information is required prior to any work being started.

E. The City will provide to the contractor a list of hazardous chemicals at any City facility where work is being performed. The locations and SDS information will be provided prior to any work starting. The contractor is responsible for disseminating this information to its employees.

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END OF SECTION 2005

SECTION 2006 ASBESTOS PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. If asbestos pipe is indicated on the plans for removal, tapping, connection to or other work, or if asbestos pipe is discovered on the project site, then the Owner shall have prepared an asbestos pipe work plan or an asbestos pipe mediation plan. The Owner will submit the asbestos pipe work plan or an asbestos pipe mediation plan to the City for review and approval prior to work beginning that includes asbestos pipe.

B. Comply with U.S. Environmental Protection Agency (EPA) 40 Code of Federal Regulations (CFR) Part 61, Subpart M, National Emission Standards for Asbestos.

C. Comply with OSHA (Occupational Safety and Health Administration) Standards 29 CFR 1926 Safety and Health Regulations for Construction Subpart Z, Toxic and Hazardous Substances, Standard 1926.1101-Asbestos, of the Code of Federal Regulations and as follows.

D. Comply with Arkansas Department of Environmental Quality (ADEQ) regulations including Regulation 21, The Arkansas Asbestos Abatement Regulation.

When required by ADEQ Regulations, provide the Notice of Intent to remove asbestos to ADEQ and copy to the City, Owner and Contractor or Engineer of Record.

E. The Contractor is responsible for ensuring that safe working conditions exist and safety procedures are being followed at the work site. The Contractor is responsible to comply with all Federal, State and City laws, rules or regulations stated or not stated within these specifications.

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END OF SECTION 2006

SECTION 2100 EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

A. All projects shall include erosion and sediment control features.

B. Comply with the published City Engineering regulations and standards and as follows.

1.01 WORK INCLUDED

A. For Capital Improvement Projects, and other projects where required by Ordinance or standards, the Engineer shall submit an erosion control plan for the Work to the City for review and approval.

The Contractor shall accomplish temporary and permanent erosion protection in accordance with approved plans and project specific specifications, City Ordinances, manuals and standards, and State and Federal regulations.

City requirements include, but are not limited to:

ITILE XV Unified Development Code (UDC)
Chapter 167: Tree Preservation and Protection
Chapter 169: Physical Alteration of Land
Chapter 170: Stormwater management, drainage and erosion Control,
Chapter 168: Flood Damage Prevention- section 168.12 Streamside Protection Code

Streamside Protection Best Management Practices (BMP) Manual

Drainage Criteria Manual dated July 1, 2014

City of Fayetteville City Engineer's office Standard Specifications, Manuals and Standard Details, City of Fayetteville, are found at:

http://www.fayetteville-ar.gov/445/Engineering-Specs-Details

B. The Contractor is responsible for implementing and maintaining Best Management Practices (BMPs) during construction activities, including, but not limited to, sediment and erosion control structures and achievement of final stabilization upon completion of construction activities.

C. The Contractor shall be responsible for implementing all applicable requirements of the ADEQ General Stormwater Permit for Construction Activity, the Spill Prevention Control and Countermeasures Plan (SPCCP), as required by USEPA, local Municipal Separate

Storm Sewer requirements, and all other environmental regulatory requirements that are associated with the construction activities that they are contracted to perform. The Contractor is responsible for managing all materials, equipment, and activities at the work site in a manner that is in compliance with local, State, and Federal environmental regulations.

PART 2 – PRODUCTS

2.01 PRODUCTS/MATERIALS

A. Refer to City of Fayetteville City Engineer's office Standard Specifications, Manuals and Standard Details, City of Fayetteville.

PART 3 – EXECUTION

3.01 TEMPORARY EROSION CONTROL

A. Comply with Section 8.2 Erosion, Runoff and Sediment Controls for Construction Sites, of the City of Fayetteville Drainage Criteria Manual (2014 edition), the City Engineer's office Standard Erosion Control Details and as follows:

B. Water removed from open pits and/or trenches shall have silt removed prior to leaving the immediate site of construction. Silt shall be removed by natural vegetation, a straw bale trench dewatering inlet device, settling pond, filter bag, a rock/geotextile fabric sediment trap/basin, or other appropriate sediment control measure. Water filtered through a basin shall not violate any water quality standard and shall have efficient sediment/silt removal prior to discharging to a waterbody.

C. Contractor shall be responsible for providing adequate number of pumps for prompt and efficient dewatering. Ends of discharge hoses shall be provided with flow dispersion and filtration devices to prevent scouring of surface soils, discharge of turbid water, and/or washout of stream banks. Discharges from dewatering activities shall not be conveyed into or upon any roadside ditch, curb and gutter, street or publicly used thoroughfare.

D. The direct discharge of silty/muddy water to a stream, offsite, or across areas of equipment access points and/or construction haul roads is strictly prohibited.

3.02 OTHER CONTROLS

A. A dedicated concrete truck wash out area shall be maintained to include adequate containment to prevent runoff of concrete truck wash water. Concrete truck drivers shall be notified to use wash out area.

B. Contractor shall follow the appropriate waste storage and disposal practices, as per applicable environmental regulatory requirements. Solid waste dumpsters/roll-offs, or

other appropriate waste receptacles will be maintained and used at the site. Good housekeeping practices will preclude trash, construction wastes, and debris to be dumped or scattered on the construction site. There shall be no open burning of any waste material. No solid materials, including building materials, shall be discharged to waters of the State.

C. No liquid waste chemicals, fuels, and/or oils are to be leaked or spilled on ground surfaces. Bulk storage of liquid chemical wastes will be provided with secondary containment with a capacity sufficient to contain the volume of the largest container within the secondary containment. All waste materials shall be stored in a manner to prevent releases and should be disposed of by a qualified waste disposal firm at an acceptable waste disposal facility. Records of the disposal of all solid, hazardous, non-hazardous, and liquid wastes are to be maintained by the Contractor. Contractor shall notify the Engineer of any spills or leaks that occur in spite of the preventive measures taken. Contractor will prepare a report of any spills or leaks in accordance with the reporting and recordkeeping measures described in the BMPs. No contaminants from fuel storage areas, hazardous waste storage and truck wash areas shall be discharged to waters of the State. These areas should not be located near a water body.

D. Contractor shall maintain compliance with applicable State and/or local sanitary sewer, septic system, and waste disposal regulations.

E. Off-site vehicle tracking of sediments and the generation of dust must be minimized. Measures such as stone at construction access points, parking areas, and unpaved roads, providing entrance wash racks or stations for trucks, and/or street sweeping shall be implemented where appropriate. Application of water to construction haul roads should be done, as appropriate, to control dust generation. Application of excessive levels of water that create mud should be avoided.

F. The Contractor shall be responsible for maintaining the site and adjoining paved surfaces in a dust free condition. Fugitive dust control is the sole responsibility of the Contractor.

3.03 PERMANENT EROSION CONTROL

A. The Contractor shall incorporate permanent erosion control features into the project at the earliest practicable time as the construction progresses all in accordance with the approved plans and project specifications, City Ordinances, City manuals and standards.

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END OF SECTION 2100

SECTION 2200 SITE PREPARATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation, grading, cutting and removal of trees, shrubs and underbrush, and the removal of any debris existing above natural ground surface and within the cleared area necessary for the construction of the improvements.

PART 2 - PRODUCTS

A. Not used

PART 3 - EXECUTION

3.01 GENERAL

A. For Development Projects, the Owner and his contractor are responsible for all costs incurred by reason of the requirements of this section. For Capital Improvement Projects, it shall be the responsibility of each bidder to examine the site carefully and make his own calculations as to costs to be incurred by reason of the requirements of this section.

B. The Contractor shall not remove or disturb any vegetation except that required for the execution of the work.

C. Trees, shrubs, underbrush and debris removed will be disposed of by the Contractor in a manner approved by the City.

D. If access roads are required and not indicated on the plans, then the Contractor will be required to submit a plan for construction of access roads for review and approval by the Engineer.

3.02 SITE PREPARATION

A. Clear areas as indicated or only as necessary for performance of the work. Confine operations to that area provided through easements, documented agreements and rights-of-way.

For Capital Improvement Projects, entrance upon any lands outside of that area provided by easements or public rights-of-way, shall require documented written approvals with copies provided by the Contractor to the City.

B. For Capital Improvement Projects, do not occupy any portion of the project site prior to the date established in the Notice to Proceed without prior approval of the Owner.

C. The engineer will notify the contractor of requirements by individual property owners as stipulated in easement documents pertaining to the project.

D. Remove, relocate, reconstruct or work around natural obstructions, existing facilities and improvements encountered during site preparation as herein specified. Take care while performing site preparation work adjacent to facilities intended to remain in place. Promptly repair damage to existing facilities. Dispose of waste materials in a satisfactory manner off the work site.

E. Protect, move, or brace public and private utilities as required by the affected utility.

F. Maintain mailboxes in the manner that the Postal Service requires to prevent interruption of mail delivery.

G. Site preparation includes the removal of trees, shrubs, brush, crops, and other vegetation within the limits of the easements (right-of-way), or as may be provided for in licenses, permits and agreements. For Capital Improvement Projects, all efforts shall be made to retain existing landscaping. For development projects these requirements will follow the Owner's agreements and City Ordinances and City regulations. In the event that trees, shrubbery, and hedges cannot be saved, then prior approval of the property owner and the City's Representative must be obtained before the existing landscaping is removed.

1. Trees
    a. Comply with Chapter 167: Tree Preservation and Protection of the City's UDC. All trees shall be saved unless removal is approved by the Engineer and the City. Trim trees in accordance with the City's regulations including the City of Fayetteville Tree Preservation, Protection, and Landscape Manual.

2. Shrubbery
    a. Shrubbery shall be saved unless removal is approved by the Engineer and the City. Make reasonable efforts to save all shrubbery by trimming, in accordance with acceptable pruning practices, and treating wound surfaces with a commercial pruning compound.

3. Small Plants and Flowers
    a. At least two weeks prior to the start of construction, notify property owners of the proposed starting date so that the property owners can remove any small plants or flowers.

4. Protection of Existing Facilities

    a. The Contractor shall notify all property owners in the immediate vicinity of the construction area that may be affected by the construction activities a minimum of 24-hours before starting work in that area. The notification

shall include a description of the work, work hours, and a 24-hour contact name and number for the contractor.

b. Fences interfering with construction, and located within public rights-of-way or as may be allowed for in permits or agreements, may be removed only if the opening is provided with a temporary gate which will be maintained in a closed position except to permit passage of equipment and vehicles, unless otherwise herein specified. Fences within temporary construction easements may be removed provided that temporary fencing is installed in such a manner as to serve the purpose of the fencing removed.

c. Fencing removed shall be restored or replaced to the condition existing prior to construction unless otherwise specified. Temporary fencing meeting the requirements of the land owner will be provided when requested by the land owner, Engineer or Owner. The Contractor is solely liable for the straying of any animals protected or corralled, or other damage caused by any fence so removed.

d. Driveways and driveway approaches removed or damaged during construction shall be restored to the original or better condition.

e. Make every reasonable effort to protect private sewer facilities. Private sewer facilities may not be shown on the Plans.

f. Preserve property corners, pins and markers. In the event any property corners, pins, or markers are removed by the Contractor, such property points shall be replaced at the Contractor's expense and shall be re-set by competent surveyors properly licensed to do such work. In the event such points are section corners or Federal land corners, they shall be referenced and filed with the appropriate authority.

g. Where existing utilities and service lines are encountered, notify the owner thereof at least 48 hours (not including weekends and/or holidays) in advance of performing any work in the vicinity.

h. Excavate, install pipeline and backfill in the vicinity of such utilities in the manner required by the respective owner and, if requested, under his direct supervision. The Contractor shall be responsible for damages to a public or private utility that may occur as the result of the construction.

i. Protect, move, or brace public and private utilities as required by the affected utility.

j. Make a reasonable effort to ascertain the existence of obstructions and locate obstructions by digging in advance of machine excavation where definite information is not available as to their exact location. Where such

facilities are unexpectedly encountered and damaged, notify responsible officials and other affected parties and arrange for the prompt repair and restoration of service.

END OF SECTION 2200

SECTION 2300 EXCAVATION, BACKFILLING AND COMPACTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation, backfilling, and compaction for water lines, sewer lines, appurtenances, and incidental construction.

1.02 GENERAL

A. Comply with the recommendations of AWWA C600 and AWWAC605 latest editions, except as modified or limited within these specifications.

1.03 QUALITY ASSURANCE

A. When requested by the City's designated engineer, the Engineer of Record will provide:

1. One moisture/density relationship test (AASHTO T-99, or AASHTO T-180) taken at the beginning of the project, and one additional moisture/density relationship test taken for every 5,000 cubic yards of imported material.

2. The field density of adjacent undisturbed soil in accordance with ASTM D2922 (Standard Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods, Shallow Depth) locations as determined by the City.

3. A minimum of one density test per street crossing and/or one density test per 500 lineal feet of pipe or portion thereof when the pipe is located in the street, under pavement, under the curb and gutter, under sidewalks or trails or other locations as determined by the City.

4. Other project specific tests as required by supplemental specifications provided by the Engineer of Record.

B. Provide submittals as specified or as requested by the City's designated engineer.

1.04 UTILITIES PROTECTION

A. The Work included in this Project may require excavation and related activities in close proximity to existing buried and aerial utility lines and facilities, such as water lines, sewer lines, storm drains, natural gas lines, electrical power lines, telephone cables, and TV cables. Where their presence is known, the approximate location of such utilities is shown on the Drawings, but all such utilities and individual service lines are not shown. The Contractor shall be aware of the potential for such utility lines to conflict with intended construction efforts, and the Contractor shall use appropriate precautionary measures to locate and protect such utility lines and services so as to avoid damage and interruptions to

service.

B. The Contractor shall contact the owners of the various existing utilities lines and services as may be affected by the construction and solicit their assistance in identifying, locating, marking, and protecting these facilities prior to the beginning of any excavation or other work which might endanger the existing utilities. If such utilities are damaged or impaired because of the Contractor's actions or omissions, the Contractor shall be responsible for the cost of repairs or replacements of the affected or damaged utility or service line.

C. The Contractor shall comply with the "Arkansas Underground Facilities Damage Prevention Act" including latest amendments, the Arkansas One-Call System, and shall alert potentially conflicting utility systems accordingly.

D. The Contractor is responsible for protecting public and private property. The Contractor is responsible for the Contractor's safety plan and implementation.

1.05 SEDIMENT CONTROL

A. The Contractor shall be responsible for all sediment control in accordance with Section 2100 – Erosion and Sediment Control.

B. The Contractor shall be responsible for maintaining the site and adjoining properties and adjoining paved surfaces in a dust free condition.

PART 2 – PRODUCTS

2.01 FOUNDATION MATERIALS

A. Foundation materials for trench over excavation shall be Class 7 Aggregate Base Course (ABC), "B" stone with class 7 aggregate cap, or concrete as designed by the Engineer of Record.

2.02 EMBEDMENT MATERIALS

A. Embedment materials are restricted to materials specified below. The Engineer of Record shall provide as a submittal the gradation sieve analysis of the embedment materials proposed for each specific project.

B. Without regard to the pipe material, all embedment materials include: bedding, pipe zone (including haunching), and initial backfill from six (6) inches below the bottom of the pipe to six (6) inches above the top of the pipe the full trench width with a minimum of six (6) inches of embedment materials all around the exterior of the pipe.

C. Special design considerations, including supplemental trench drains, geotechnical fabric, and/or specific aggregate, and/or filter gradations as recommended in AWWA C605 and

ASTM D2321 may be required to prevent migration of embedment particles. The Engineer of Record is responsible to design the embedment system as needed for the specific project.

D. Embedment materials for water lines. The maximum aggregate size shall be 3/4 inch. The Engineer of Record will design the installation using embedment materials as ASTM C33 gradation #7 or ASTM C33 gradation 67 as modified and described below:

1. Crushed aggregate conforming to ASTM C 33, gradation 7 as follows:

ASTM gradation Size 7 (not class 7)

Crushed aggregate sized from nominal 1/2 inch to No. 8 sieves:

100 percent passing the 3/4 inch sieve
90 to 100 percent passing the 1/2 inch sieve
40 to 70 percent passing the 3/8 inch sieve
0 to 15 percent passing the No. 4 sieve
0 to 5 percent passing the No 8 sieve

2. Crushed aggregate conforming to the ASTM C 33, gradation 67 and as follows:

Crushed aggregate sized from maximum 3/4 inch to No. 8 sieves:

100 percent passing the 3/4 inch sieve (maximum aggregate size 3/4 inch)
20 to 55 percent passing the 3/8 inch sieve
0 to 10 percent passing the No. 4 sieve
0 to 5 percent passing the No 8 sieve

The required modification of the ASTM C 33, gradation 67 is the clarification and potential additional requirement of 100 percent passing the 3/4 inch sieve. Some aggregate suppliers for Fayetteville projects are currently meeting this requirement (maximum, not nominal, aggregate size 3/4 inch) as required in the 2012 Standard Specifications.

D. Embedment materials for sewer lines shall be a Class I crushed aggregate material in accordance with ASTM D2321 meeting the gradation requirements of ASTM C 33, gradation 7 as specified above for water lines, or the same crushed aggregate material conforming to a modification of the ASTM C 33, gradation 67 as specified above for water lines, or ASTM Class 67 stone. The Engineer of Reocrd is responsible to design the embedment and to verify the proper use of embedment materials for water and sewer installation.

2.03 BACKFILL MATERIALS

A. AGGREGATE MATERIAL

Aggregate material for select backfill across streets, roads, driveways, and for placement of "gravel" or aggregate surfaced areas, shall be Class 7 Aggregate Base Course (ABC) material conforming to the Standard Specifications of the Arkansas Highway & Transportation Department, latest edition.

B. SELECT NATIVE BACKFILL MATERIAL

Select native material shall be suitable on-site materials or imported good earth, sand, or gravel that is free from large rocks or hard lumpy materials. Never use materials of perishable, frozen, spongy or otherwise unsuitable nature as select material.

Initial backfill when consisting of select native materials, shall be free of rocks, stones or particles greater than 3 inches in diameter.

C. FLOWABLE SELECT MATERIAL

Flowable select materials, aka flowable fill or controlled low strength materials, for select backfill where indicated on plans across streets, roads, and driveways shall be Flowable Select Material conforming to the Standard Specifications of the Arkansas Highway & Transportation Department, latest edition.

D. CHERTY RED CLAY aka “HILLSIDE”

Locally available red clay chert material with a minimum of 55 percent retained on the #4 sieve prior to compaction, CBR of eight or greater and classified as GM or GC. The Engineer of Record shall provide as a submittal the geotechnical analysis of the proposed “Hillside” cherty red clay material for each specific project.

E. RIPRAP

1. Riprap material is not permitted as a Standard Specification.

2. Riprap material will be considered on specific case by case basis and in accordance with Sections 1000 General Conditions.

3. Riprap material, if approved, shall be designed in accordance with the City of Fayetteville Drainage Criteria Manual dated July 1, 2014.

PART 3 – EXECUTION

3.01 PROTECTIVE SYSTEMS - EXCAVATIONS AND TRENCHES

A. Comply with all Federal, State and Local requirements.

B. Comply with the requirements as specified elsewhere with these Specifications.

C. The Contractor is responsible for the Contractor's safety plan and implementation.

3.02 EXCAVATION - GENERAL

A. Excavation shall be carried accurately to the line and grade indicated on the drawings and as established by the Engineer.

B. When the bottom of the excavation is at subgrade and found to be unstable or includes ashes, refuse or other organic materials, or large pieces of inorganic material, that in the judgement of the engineer should be removed, the contractor will remove all such material (over-excavate) to the extent required by the engineer.

Over-excavation will be backfilled with foundations materials per 2.01 B and as directed by the engineer.

C. Dewater all excavations as required and as follows:

1. Comply with Section 2100 EROSION AND SEDIMENT CONTROL.
2. Prevent groundwater contamination.
3. Dewater to the extent that water or sewer pipe can be placed on a dry and firm trench bottom. Never place pipe in a wet or unstable trench.
4. When requested by the City, the Contractor, or the Engineer of Record, will provide a dewatering plan based upon the Engineer of Record's dewatering engineered design.

3.03 DISPOSAL OF EXCAVATED MATERIALS

A. The Contractor shall be responsible for disposal of excess material, or disposal of excavated material unsuitable for backfilling.

B. Disposal of excess material on private property shall only be allowed with written permission of the owner of the property. A copy of the written permission must be forwarded to the Engineer along with any permits as may be required by the governing authority, city or county. Grading permits are required for any disposal within the City of Fayetteville city limits.

3.04 EXPLOSIVES

A. The use of explosives/blasting materials is not permitted as a Standard Specification.

B. The use of explosives will be considered only on specific case by case basis in accordance with Section 1000 General Conditions. Approval will be project specific and requires approval from both the Utilities Director, Fire Chief and the designated City engineer.

3.05 EXCAVATION –TRENCHES

A. Trench For Water or Sewer Line - During excavation, all pipe to be replaced shall be properly removed and properly disposed of offsite at a suitable landfill. Trench excavation for water or sewer lines shall be kept within the maximum width limits specified below. The specified maximum trench width from the bottom of the trench to 24-inches above the outside top of the pipe shall not be exceeded unless authorized by the Engineer.

Refer also to SECTION 2006 ASBESTOS PIPE.

B. Trench For Water or Sewer Line in Paved Area additional requirements – Prior to excavation in paved areas, the Contractor shall saw-cut (or other acceptable method approved by the Engineer) the existing pavement to minimize the destruction of the existing pavement outside the limits of the trench. The maximum trench width for the installation of water or sewer lines, up to 12-inches in diameter, in paved areas shall not exceed 36-inches without written approval from Engineer. The pavement shall be repaired in accordance with Section 6000 – Pavement Repair. Contractor is responsible for damage to paved areas by construction equipment outside the limits of trench excavation.

C. The bottom of the trench shall be prepared to provide a uniform and continuous bearing and support for the pipe on solid or compacted soil. Further, shallow depressions shall be made in the trench bottom to accommodate bellends. It is a requirement for bell or coupling holes to be excavated where no part of the load is supported bells couplings or fittings.

D. Standard Trench Widths:

Refer to the Standard details prepared by the City of Fayetteville Engineering Division.

Minimum	Maximum
Outside pipe diameter + 12 inches	Outside pipe diameter + 24 inches

Notes:

(1) Pipe diameters larger than 24 inches may require specific project trench design
(2) Site specific soil conditions may require specific project trench design
(3) Trench widths may vary per specific project trench design to comply with Section 2003 TRENCH SAFETY/PROTECTIVE SYSTEMS

E. Unless approved otherwise by the designated City engineer, limit trench excavation to one hundred (100) feet ahead of the completed pipe work and backfill. The City, or the Engineer of Record, may lower this limit in traffic or congested areas.

3.06 EMBEDMENT AND BACKFILLING - GENERAL

A. Install all water and sewer pipe using approved embedment materials only.

B. Structure foundation subbase or structure concrete sub-foundations require project specific design.

C. Backfilling includes refilling and compacting the fill in the excavation to the elevations indicated. Backfilling includes initial back fill, final backfill and surface materials.

D. All backfill shall be placed in layers of appropriate thickness and compacted using a mechanical, hydraulically-powered vibratory trench compactor or other equivalent equipment.

E. Unless designed otherwise by the Engineer of Record, use select native materials for backfilling in unpaved areas (only).

F. Where trenches are to be located beneath existing or proposed streets, drives, and parking areas, all backfilling procedures shall be in accordance with the Standard details prepared by the City of Fayetteville Engineering Division.

G. Compaction testing will be provided by the contractor utilizing an independent testing agency approved by the City.

3.07 EMBEDMENT AND BACKFILLING PIPE ADDITIONAL REQIREMENTS

A. A continuous and uniform embedment shall be provided in the trench for buried pipe. Embedment materials shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe.

B. Install embedment materials in no greater than eight (8) inch compacted lifts. Install embedment materials from six (6) inches below the bottom of the pipe to six (6) inches above the top of the pipe. Shovel slice bedding beneath the pipe haunches.

C. Unless approved otherwise by the designated City engineer, compact all embedment material to a minimum density of 90% standard proctor as outlined in AASHTO T-99.

D. Unless designed otherwise by the Engineer of Record for deep bury/installation the tracer wire will be installed on top of the pipe to a maximum of six (6) inches above the top of pipe.

E. Pipe marking tape shall be provided in all trenches for water or sewer line construction. Installation shall be per manufacturer's recommendations and shall be as close as practical to finished grade while maintaining a required minimum of 18 inches between the marking tape and the top of any pipe line.

F. Provide a minimum cover of thirty-six (36) inches over the top of sewer pipe.

G. Provide the following cover for water pipe:

1. Minimum depth to the top of pipe for all water main lines less than 12- inches diameter shall be 3.0 feet.

2. Minimum depth to the top of pipe for water lines 12 –inches diameter and greater shall be 4.0 feet.

3. Maximum water line cover shall be 5.0 feet under normal conditions. Cover greater than 5.0 feet shall be allowed for short distances where required by field conditions and approved by the City.

4. Minimum depth of all water service lines from the main to the water meter shall be 30-inches.

H. The maximum depth of bury for PVC pipe as a standard specification is sixteen (16) feet. Any depths of bury greater than sixteen (16) feet require project specific design by the Engineer of Record or the use of ductile iron pipe.

I. Install pipe in accordance with Section 3100 and Section 4100.

J. Backfill and compact the excavation.

K. Maintain all temporary surfaces in good condition until permanent repairs are complete.

3.08 MISCELLANEOUS STRUCTURES

A. Excavate a sufficient distance from walls and footings to allow for forms, protective systems and observation.

B. Backfill as indicated on Standard details prepared by the City of Fayetteville Engineering Division or project specific drawings.

3.09 BORES/PIPE BORING

A. Bores, pipe boring, pipe jacking and similar installations of encasement and carrier pipes are indicated in SECTION 3400 BORES AND STEEL ENCASEMENT PIPE.

END OF SECTION 2300

SECTION 2400 GENERAL INSTALLATION INFORMATION AND PROCEDURE

1.01 GENERAL

A. Before installation of pipe and appurtenances, the trench bottom shall be graded so uniform support of the pipe and appurtenances are provided per Section 2300 Excavation, Backfilling and Compaction.

B. Comply with the recommendations of AWWA C600 and AWWAC605 latest editions, except as modified, limited and/or further specified within these specifications.

C. Additional sewer specific and water specific requirements are found in Sections 3100 and 4100 respectfully.

1.02 HANDLING PIPE MATERIALS

A. The Contractor shall handle the material with the utmost care and in a manner to prevent damage to the materials, material coating and lining during loading, hauling, unloading, and installation operations. Hooks, chains, or cables shall not come into contact with the exterior/interior of pipeline materials. It is recommended to use approved nylon straps or approved clamps to handle pipeline material. Material damaged shall be replaced at the contractor's expense.

B. Hooks shall not be in contact with the pipe interior and to the extent possible the interior of the pipeline materials shall be kept free from dirt and foreign matter.

C. Pipeline materials, including valves, hydrants and fittings shall be drained and stored in a manner to protect them from damage by freezing. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

D. Proper implements, tool and facilities shall be provided and used by the Contractor for the safe execution of the work.

E. All foreign matter or dirt shall be removed from the inside of the pipe and appurtenances before lowering into the trench and the pipe interior shall be kept clean during and after laying. A swab shall be kept in the water line as long as the pipe is being laid. Care shall be taken to prevent dirt from entering the joint space. When pipe laying is not in progress, the open ends of the pipe shall be closed by installing a plug or cap of sufficient design to prevent trench water, foreign matter and dirt from entering the pipe.

F. Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workman like manner without damage to the pipe or pipe lining. Torch cutting is not permitted. All pipe shall be cut at 90 degrees to the pipe centerline. Cutting at other angles to provide greater deflections at joints shall not be permitted. Field welding or welding except by the pipe manufacture shall not be permitted.

G. Cut ends shall be beveled according to the manufacturer's recommendation to prevent damage to the bell gasket.

1.03 PIPE INSTALLATION - GENERAL

A. Install PVC pipe and DIP as recommended by the manufacturer and as follows.

B. Inspect each joint of pipe carefully internally and externally before it is placed in the trench. Plainly mark and separate from the remaining pipe any joint found to be cracked, warped, or otherwise damaged. Remove these damaged joints from the project site as soon as possible.

C. Unless otherwise designed by the Engineer of Record and approved by the City, all pipe shall be laid with bell ends facing the direction of progress such that spigots are pushed into bells, not bells pushed onto spigots; and for lines on appreciable slopes, bells shall face upgrade.

D. No pipe shall be laid in water, or when the trench condition or the weather is unsuitable for such work.

E. The pipe, fittings, valves, fire hydrants, meter boxes, manholes and other appurtenances shall be constructed to conform to the location, line size and material and grades specified or indicated on the approved plans.

F. When necessary to deflect PVC pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of one degree (1°) (equal to 4 inches per 20 feet).

G. When necessary to deflect DIP pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of three degree (3°) (equal to 12 inches per 20 feet).

H. Pipe barrel bending shall not be allowed.

I. All buried iron pipes, valves, and fittings shall be double poly wrapped.

J. Valves and fire hydrants shall be set with operating stem and nut plumb.

1.04 JOINTING PVC AND DUCTILE IRON PIPE AND FITTINGS

A. Make all pipe joints in strict accordance with the manufacturer's recommendation and as follows for the particular type of connection. Make all joints watertight in accordance with the latest ASTM Standards.

B. Prior to jointing the pipe, and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth or brush, removing all foreign materials from the bells, especially the gasket seats. Any burrs or imperfections in that part of the plain end or bell, which will be in contact with the gasket, shall be removed.

C. The clean rubber gasket shall be inserted in the bell and a thin film of lubricant shall be applied per the manufacturer's recommendations. Pipe lubricants specified by the pipe manufacturer shall be used. For water lines the contractor shall lubricate the gaskets and/or spigots with the manufacturer's recommended and NSF-61 approved lubricant.

D. The cleaned plain end shall initially be entered into the bell straight. The plain end shall be pushed inside the gasket and bell until it strikes the end of the interior if the bell, after which the end of the pipe will be moved sideways or as specified by the manufacturer's requirements to move the pipe slightly away from the home position to allow for expansion and to provide flexibility for the complete pipeline.

E. When connecting the pipe or fittings according to manufacturer's requirements, care shall be taken to avoid damage to where the pushing device or machine contacts the pipe. A wood block or suitable pad shall be placed between the pipe and that part of the pushing device which contacts the pipe or fitting.

F. All plain ends that enter a push-on bell shall be beveled as specified by manufacturer requirements. All cut pieces or ends of pipe of other classifications shall be so beveled.

G. All buried iron pipes, valves, and fittings shall be double poly wrapped.

1.05 JOINTING FLANGED PIPE AND FITTINGS

A. The faces of all flanges shall be thoroughly cleaned and all burrs or imperfections removed with a steel brush.

B. Surface coating or lining touch up shall be provided to match original coating or lining.

C. Gaskets shall be AWWA approved of 1/16 inch minimum thickness.

D. All bolts and nuts shall be cleaned and lubricated prior to tightening. Bolts on opposite sides shall be tightened alternatively to the torque recommended by the manufacturer.

1.06 JOINTING MECHANICAL JOINT PIPE AND FITTINGS

A. Comply with AWWA C600 Table I latest edition and the manufacturer's recommendations.

The range of torque for pipe size and bolt size varies per application. The Engineer of Record shall furnished to the City as a submittal the project specific materials used and the range of torque required for the assembly and materials.

The AWWA C600 Table 1 Mechanical-joint bolt torque includes:

Joint Size In.	Bolt Size In.	Range of Torque ft-lbs
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1 1/4	120-150

B. The spigot end of the pipe, the bell of the connecting pipe, and the rubber gasket shall be thoroughly cleaned using soapy water and cloth, removing all foreign materials from the bells, especially the gasket seats as specified for push-on joints. Clean the gland in a similar manner. An approved pipe lubricant shall be applied to the spigot end of the pipe and the gasket.

C. After the gland and gasket are placed on the spigot end of the pipe, a sufficient distance from the end to avoid fouling the bell, insert the spigot end in the fitting bell to the point of firm contact with the bell shoulder. Then advance the rubber gasket into the bell and seat in the gasket seat. Hammering the gasket into the seat is not permitted. Exercise care to center the spigot end within the bell. Bring the gland into contact with the gasket, enter all bolts, and make all nuts hand tight. Exercise continued care to keep the spigot centered in the bell.

D. Make the joints tight by turning the nuts with a torque wrench: First partially tighten a nut, then partially tighten the nut 180 degrees away from it. Work around the pipe with uniformly applied tension until the required torque is applied to all nuts.

E. The Contractor shall provide a torque wrench suitable for measuring tension on bolts.

F. Proper actuation of the gripping wedges for restraining glands shall be ensured with torque limiting twist off nuts. Tightening sequence shall be as follows. First partially tighten a nut, then partially tighten the nut 180 degrees away from it. Work around the pipe with uniformly applied tension until the required torque is applied to all nuts. Failure to follow proper the proper tightening sequence will result in the disassembly of the joint, removal of the current restraining gland, and installation of a new restraining gland. Any damage to PVC pipe shall be removed as well.

G. All buried iron pipes, valves, and fittings shall be double poly wrapped.

H. The rubber gasket and joint bolts of mechanical joint retainer glands shall be installed in accordance with the above section. Set screws shall be tightened evenly to approximately 75 ft-lbs or as recommended by the manufacturer.

1.07 TRACER WIRE

A. Comply with Arkansas Law Section § 14-271-111 (a)(2) which includes: "In addition to the foregoing, all underground facilities installed after January 1, 1996, shall be permanently marked with tracing wires of appropriate durability or in other manner which will enable the operator to trace the specific course of the underground facility.", and as follows:

B. Tracer wire shall be installed on all buried pipelines including water mains, water leads and water service lines without regard to pipe material. Tracer wire shall be installed on all buried sewer gravity mains, sewer force mains and gravity or pressure sewer services/sewer laterals without regard to pipe material.

C. Unless designed otherwise by the Engineer of Record for deep bury/installation the tracer wire shall be installed directly on, to 6-inches above, the top of the pipe for sanitary sewer and 6-inches above pipe for waterlines.

D. As designed by the Engineer of Record and approved by the designated City engineer or Utilities Director, the tracer wire will terminate and/or connect at:

1. An approved site specific application tracer wire box as manufactured by Copperhead Industries, LLC. or approved equal or,
2. Interior to sewer manhole, passing just below the frame or,
3. Terminate in a valve box as designed by the Engineer of Record and approved by the designated City engineer or Utilities Director.

E. Unless approved otherwise by the Engineer of Record and the City's designated engineer, all tracer wire installation will include a grounding anode at the termination and/or connection locations.

1.08 MARKING TAPE

A. Marking tape shall be installed on all buried water or sewer pipelines without regard to pipe material. This includes gravity sewer mains, sewer force mains, gravity sewer laterals, water mains and water services.

1. Marking tape shall be installed 18-inches above the top of pipe.

1.09 CONCRETE MITIGATION DAM

A. Water and sanitary sewer designs shall include the effects of the trench functioning as drainage or groundwater conveyance.

Where indicated on the approved plans, or determined by the Engineer in the field, concrete dams or concrete dams with slotted drainage pipe will be constructed at each connection location of new sewer pipe to the existing sewer system. Concrete dams with, or without slotted drainage pipe will be provided to help control the migration of groundwater from the new sewer trench to the exiting sewer system or adjacent property.

Concrete dams shall be constructed in the sewer trench, outside the limits of excavation for manholes. Slotted drainage pipe where used will terminate in an approved drainage conveyance.

B. Hand excavate around the sewer pipe into undisturbed earth a minimum of six inches into bottom of the trench and the trench wall perpendicular to the pipe. The hand excavated void around the pipe shall be filled with concrete and a form shall be used to hold the concrete in place. The form may be left in place after backfilling and restoration. The concrete dam shall be 8-inches thick, non-reinforced and extend to the elevation indicated on the approved plans.

C. Slotted drainage pipe ("trench drains) shall also be provided at concrete dams or low points from the bedding to defined drainage when required by the City.

1.10 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

A. Comply with the recommendations of AWWA C105 latest edition and as follows.

B. Two layers ("double wrapped") of polyethylene material minimum 8 mils thickness, either in tubing form or in the form of flat sheet or rolls shall be placed around all buried mechanical joints of pipe and fittings, valves, fire hydrants, and all saddles, sleeves, and couplings, tapping saddles, and any other appurtenance with exposed bolts. Any and all iron or steel components installed below ground shall be wrapped with the polyethylene material.

Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal. Each of the two polywrap layers shall be independently taped.

C. Ductile iron and steel pipe and appurtenances shall be completely encased in polyethylene tubing material. It is not the intent that the material form an enclosure that is absolutely air or water tight, but to prevent pipe to soil contact.

D. All tongs, cables, or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.

E. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place.

F. Polyethylene material shall be stored on the job site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed forty-eight (48) hours.

G. Backfill material shall be the same as specified for pipe without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, and/or other material that could damage polyethylene.

END OF SECTION 2400

SECTION 3000 SEWER PIPE, FITTINGS AND MATERIALS 1

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers pipe, pipe joints, and fittings and other materials for sanitary sewer pipelines and sewer service lines.

B. Use only pipe, fittings, adapters and appurtenances approved by the City of Fayetteville.

C. Use bends, tees, plugs, wyes, or other approved fittings constructed from the same material as the pipe in which they are installed. Use only standard, approved fittings.

D. The Standard Specification includes pipe and fitting in diameters up to and including 18-inch diameter. Pipe and fittings for nominal pipe diameters/sizes greater than 18-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 SUBMITTALS

A. Use of materials other than those specifically listed below is prohibited.

B. Submit the manufacturer's certificate that the materials meet with these Specification requirements including material testing requirements.

PART 2 – PRODUCTS/MATERIALS

2.01 PROHIBITED PIPE MATERIALS

A. The following materials are specifically forbidden for use either in city sewers or service lines:
1. Asphalt impregnated fiber tube pipe.
2. Clay pipe.
3. Concrete pipe.
4. Open profile PVC pipe as defined in ASTM F794.
5. “No Hub” cast iron soil pipe or other non bell and spigot pipe.

2.02 SERVICE LINES AND FITTINGS

A. Service lines shall typically be four (4) inches in diameter PVC pipe and PVC fittings. Six (6) inch PVC services may be approved when constructed to the same standards as sewer main lines.

B. Four (4) inch PVC pipe and PVC fittings for service lines shall be SCH 40, glue joints, and shall be completely bedded as required for larger diameter PVC pipe.

2.03 CLEANOUTS

A. Cleanouts shall be two-way opposing, SCH 40 PVC "Memphis Code" style. The riser pipe shall be topped off with a screw type plug.

B. Cleanouts shall not be installed in areas of surface depressions or features that pond water.

C. All cleanouts installed in asphalt or concrete shall be protected by a cast iron short bodied valve box, Model 70 as manufactured by East Jordan Iron Works.

All cleanouts installed in areas other than asphalt or concrete including but not limited to lawn areas, will have the cleanout and cap protected from damage by a cast iron short bodied valve box, meter box or other method approved by Utilities Director.

D. On a case-by-case basis, the City may require a 6-inch thick, 24-inch square concrete collar to be poured around a sewer cleanout for protection in greenspaces.

E. On a case-by-case basis, the City may require a below-grade cleanout with protective vault (Utility Defender or approved equal).

2.04 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE (Solid Wall)

A. PVC pipe for gravity sewer mains or force mains shall be green in color and imprinted with "SEWER".

B. Pipe fifteen (15) inches in diameter and less: conform to ASTM D 3034. Maximum standard dimension ratio (SDR) shall be twenty six (SDR 26).

C. Pipe greater than (15) inches in diameter: conform to the requirements of ASTM F 679 with pipe stiffness designed for the specific site and project. Sanitary sewer larger than 15 inch diameter requires specific review and approval from the City.

D. Joint connections for internal or external pressure less than 25-ft head: push on, flexible watertight elastomeric gaskets conforming to ASTM D 3212. Joint connections for internal or external pressure equal to or greater than 25-ft head require specific project design and City approval.

E. Marking In addition to "SEWER" provide: The date of manufacture, class of pipe, specification designation, size of pipe, name or trademark of manufacturer, and identification of plant/location shall be legibly marked on the outside of each pipe section in accordance with the ASTM D-3034.

F. Minimum length of a cut section of pipe shall be 5 feet.

2.05 DUCTILE IRON PIPE FOR GRAVITY MAINS

A. Gravity Sanitary Sewer ASTM A 746: Ductile Iron Pipe Gravity Sewer Pipe

B. Minimum Pressure Class shall be as follows:

1.	18-inch and smaller	350 psi
2.	24-inch	250 psi
3.	30-inch and greater	200 psi

C. Joint connections, pipe and fittings:

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.

E. Corrosion Control:

1. Interior:

All Ductile Iron Pipe and fittings used for sewer shall have an epoxy ceramic interior protective lining and exterior protective coating. The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

2. Exterior:

Where requested by the City, or indicated in the specific design by the Engineer, all Ductile Iron Pipe and fittings used for sewer shall have in addition the interior ceramic epoxy lining an ceramic epoxy exterior coating meeting the same requirements of the ceramic epoxy interior protective lining, Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

Ductile Iron Pipe and fittings not required to have an epoxy ceramic exterior coating shall be supplied with manufacturer's standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe Research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons (https://www.dipra.org/ductile-iron-pipe-resources/frequently-asked-questions/corrosion-control).

3. Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5.

4. Additional corrosion control methods including cathodic protection may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPRA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

F. Minimum length of a cut section of pipe shall be 5 feet.

2.06 DUCTILE IRON FITTINGS

A. All ductile iron fittings for Ductile Iron Pipe (DIP) and PVC pipe shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings. All fittings shall be MJ x MJ. All ductile iron fittings shall have an interior ceramic epoxy lining suitable for sewer service.

2.07 INTERIOR CERAMIC EPOXY LINING FOR DUCTILE IRON PIPE AND FITTINGS

A. Provide a minimum 40 mil nominal dry film thickness protective lining consisting of a ceramic epoxy specifically designed for wastewater environments. The ceramic epoxy will contain at least 20% by volume ceramic material.

The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

B. All cut ends and other areas requiring repair shall be immediately repaired with a manufacturers supplied field ceramic epoxy touch-up kit.

2.08 POLYETHYLENE ENCASEMENT (PIPE WRAP)

A. Polyethylene encasement shall be in conformance to ANSI/AWWA C105, latest revision. The virgin linear low-density polyethylene film shall have a minimum normal thickness of .008 inches (8 mils), and shall be provided in either flat tube or sheet form.

B. The color shall be black with nominal 2% carbon black UV inhibitor and printed per the AWWA C105 standard.

C. Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50, at least 2-inches wide, and installed as per the Polyethylene Encasement Installation Guide published by DIPRA. Duct Tape is not permitted.

D. All buried iron pipe and fittings shall be double poly wrapped.

2.09 CENTRIFUGALLY CAST FIBERGLASS GRAVITY SEWER PIPE

A. Fiberglass gravity sewer pipe is not a Standard Specification.

B. Fiberglass gravity sewer pipe will be considered on specific case by case basis in accordance with Sections 1000 1.01 B and 1000 1.07 A. Approval will be project specific and requires approval from the Utilities Director.

2.10 REINFORCED FLEXIBLE RUBBER COUPLINGS

A. Materials: Chemical resistant rubber. Flexible rubber coupling shall be Fernco or MaxAdaptor (Raptor).

B. Flexible rubber coupling shall be reinforced with a stainless steel shear ring.

C. Clamping bands: two (2) each stainless steel bands.

D. Dimensions: Inside diameter to fit the outside diameter of the different pipe materials being connected: take care that proper alignment is maintained and the spacing between pipes does not exceed 1/2 inch as shown in the City Engineering Standard Detail Drawings.

2.11 SERVICE SADDLES

A. A composite saddle using a virgin SBR compound gasket (ASTM D-2000) and a ductile iron saddle casting (ASTM A 536), by Romac.

B. All saddles shall be approved by the Engineer prior to installation.

2.12 SERVICE WYES

A. The wye material and joint type must match that of the mainline pipe.

B. Wyes shall terminate in a bell suitable for connection of a 4 inch SCH 40 PVC service line pipe as specified herein.

2.13 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes greater than 18-inch are not a Standard Specification. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

B. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes 3-inch through 18-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

C. Mechanical joint retainer glands shall be made from ductile iron and shall be designed for a working pressure of at least 350-psi for 3-inch through 16-inch ductile iron pipe, at least 305-psi for 3-inch through 12-inch PVC, and at least 250-psi for 18-inch ductile iron pipe.

D. Retainer glands shall have an approved coating system for corrosion resistance equivalent to EBBA MEGA-BOND® and manufacturing traceability. Retainer glands shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

1. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

2. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc. (USA only), or Star Pipe Products (USA only).

2.14 PIPE BELL RESTRAINTS

A. Bell restraint devices for nominal pipe sizes greater than 18-inch are not a Standard Specification. Bell restraint devices for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements, and as follows.

B. Bell restraints for AWWA C900 PVC sizes 4-inch through 12-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

C. Bell restraints for SDR26 PVC sizes 6-inch through 18-inch shall be provided as required. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

D. Bell restraints for Ductile Iron Pipe sizes 4-inch through 18-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

E. When all-thread attachments are required, **eye-bolt style attachments are not acceptable**. Romac "Ductile Lug" style attachments shall be used. All-threads shall be made of 316 stainless steel.

2.15 BOLTS

A. All bolts and nuts for valves, fittings, and restraints shall be 316 stainless steel unless specified otherwise. **Anti-seize lubricant shall be used when assembling all stainless steel hardware to reduce galling.**

2.16 FORCE MAIN MATERIALS

A. Each material acceptable for force main construction is described below. **The Engineer shall submit a design fatigue analysis to determine which material will be used.**

B. The City may require that force main be constructed in such a fashion that they may be converted to gravity sewer lines at a later date with the only modification to be adding manholes.

2.17 POLYVINYL CHLORIDE (PVC) PIPE FOR FORCE MAINS

A. PVC pipe less than 4 inches in size shall be manufactured in accordance with ASTM D-2241 and be SDR 13.5.

B. PVC pipe 4 inches through 12 inches in size shall be manufactured in accordance with AWWA C900, latest revision, and shall be DR 14.

C. PVC pipe, couplings, and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454 as defined in ASTM D1784, latest revision. Clean, reworked material generated from the manufacturer's own production shall be acceptable as long as the pipe produced meets all the requirements of the Specifications.

D. Joints for PVC pipe shall conform to ASTM Specification D-3139, latest revision.

E. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

F. Marking on pipe shall include the following and shall be applied at intervals of not more than 5 feet.

1. Nominal size in inches and OD base (for example, 4 CI).
2. PVC.
3. Dimension ratio (for example, DR 14).
4. AWWA pressure class (for example, PC 305).
5. Test pressure for hydrotested pipe (for example, T330) or if not tested, "NOT HYDROSTATIC PROOF TESTED."
6. AWWA designation number for this standard (ANSI/AWWA C900 or ASTM D-2241).
7. Manufacturer's name or trademark and production run record or lot code.

8. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable-water service.
9. “SEWER”.

2.18 DUCTILE IRON PIPE FOR FORCE MAINS

A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.

B. Ductile iron pipe shall be designed in accordance with the requirements of "Thickness Design of Ductile-Iron Pipe", ANSI/AWWA C150/A21.50, latest revision. Minimum pressure class shall be 250 psi.

C. Joint connections, pipe and fittings (latest revision):

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

E. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer’s mark, country where cast, year in which the pipe was produced, and the letters “DI” or “DUCTILE” shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 in. (356 mm) and larger shall be not less than 1/ 2 in. (13 mm) in height.

F. Corrosion Control

1. Interior:

All Ductile Iron Pipe and fittings used for sewer shall have an epoxy ceramic interior protective lining and exterior protective coating. The ceramic epoxy lining will be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

2. Exterior:

Where requested by the City, or indicated in the specific design by the Engineer, all Ductile Iron Pipe and fittings used for sewer shall have in addition the interior ceramic epoxy lining an ceramic epoxy exterior coating meeting the same requirements of the ceramic epoxy interior protective lining, Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

Ductile Iron Pipe and fittings not required to have an epoxy ceramic exterior coating shall be supplied with manufacturer's standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons.

3. Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5 and SECTION 3000 2.06 of this specification.

4. Additional corrosion control methods including cathodic protection may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPRA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

All cut ends and other areas requiring repair shall be immediately repaired with a manufacturers supplied field ceramic epoxy touch-up kit.

2.19 VALVES FOR FORCE MAINS

A. Gate valves up to 8-inch shall be the same as water valves as specified in Section 4000.

B. Valves greater than 8 inches require project specific design and City approval.

C. Full port (100% area) plug valves shall be AWWA C517, latest revision shall be manufactured by Val-Matic or Dezurik PEC.

D. Valves shall be installed along the length of the force main, not to exceed 1000' unless a variance is approved by the City for long force mains. The City will determine if plug or gate valves are appropriate. All valve boxes shall be marked sewer. An empty valve box shall be installed in the vicinity of the discharge manhole and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. A 2-inch SCH-40 PVC pipe shall be installed in the empty valve box. The pipe shall have a pipe marker label affixed and further labeled "No Valve, Tracer Wire Only." All lids shall have the word "SEWER" and a concrete pad with a minimum of 18 inches square or round dimension as appropriate. This shall be for both paved and unpaved applications.

2.20 AIR / VACUUM RELIEF VALVES

A. Sanitary sewer force mains shall be designed to avoid the need for air or vacuum release lines. If possible, force mains shall be designed without high points and with the top of the force main below the hydraulic grade line at the minimum pumping rate so that relief valves will not be needed.

B. If high points in the force main cannot be eliminated, a stainless steel A.R.I. Flow Control Accessories sewage air release valve shall be installed at each significant high point where air could become trapped. The air release valve shall be installed in a manhole structure in accordance with the requirements of Section 3300-Manholes, and provisions shall be required for draining the structure. A high point shall be considered significant if it is 2 feet or more above the minimum hydraulic grade line, or, when pumping is intermittent, above the static head line.

2.21 TRACER WIRE

A. Tracer wire shall be 12-gauge solid coated copper or coated copper clad steel for underground burial.

B. Jacket color shall be GREEN, and made of High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE) designed for direct burial.

C. Connectors shall be used for all splices or repairs. Connectors shall be moisture displacement style as manufactured by 3M DBR. Wire shall be twisted and bent, without the use of a wire nut prior to insertion into the gel cap.

D. A locate or conductivity test shall be performed prior to signing off on the project.

E. The tracer wire will terminate and/or connect at:

1. An approved site specific application tracer wire box as manufactured by Copperhead Industries, LLC. or approved equal or,
2. Interior to sewer manhole, passing just below the frame or,
3. Terminate in a valve box as designed by the Engineer of Record and approved by the designated City engineer or Utilities Director.

2.22 MARKING TAPE

A. Non-metallic sanitary sewer marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc.

B. Tape shall have a minimum thickness of 4 mils and manufactured with heavy metal-free polyethylene tape that is impervious to all known alkalis, acids, chemical reagents, and solvents found in soil. The minimum overall width of the tape shall not be less than 3-inches. Standard rolls shall be 1000’ length.

C. The tape shall be color coded Safety Green and imprinted with the following message: Caution – Buried Sewer Line Below.

2.23 SEWER LINE MARKERS

A. Sewer line markers shall be TriView Marking System by Rhino Marking and Protection Systems or Carsonite International Dual-Sided Utility Marker (CIB-380). All markers shall

be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360), and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, SEWER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998". The label shall also include the official City Logo and be white in color with green and black lettering. The label shall be affixed to two sides of the marker. **An additional white 1" wide reflective tape (3M) shall be placed around the full circumference of the top of the marker.** Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

B. Sewer line pipeline markers shall be installed beside all manholes that are located in easements and backyards. Manholes located in front yards and in streets do not require markers.

C. Sewer line pipeline markers shall be installed along sewer force mains at valves and at significant fittings that cause a change in direction.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation: refer to Section 2400

B. Sanitary Sewer Pipelines: Refer to Section 3100

C. Sanitary Sewer Service Lines: Refer to Section 3200

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END OF SECTION 3000

SECTION 3100 INSTALLATION OF SEWER PIPE, FITTINGS, AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Installation of sanitary sewer pipelines.

B. Installation of sanitary sewer service lines.

C. Point repairs on existing sanitary sewer pipelines.

1.02 DEFINITIONS

A. New Sewer Lines – Sewer lines installed in such a manner that there is no sewage flow during construction.

B. Replacement Sewer Lines – Sewer lines installed in a trench while there is a flow from "live" service connections.

C. Point Repairs - Replacement of a short section (less than 50 feet in length) in an existing sewer lines.

D. Force Mains - Sewer pipelines that transport wastewater under pressure from a pump station to a discharge point.

E. City Sewer Main - A public sanitary sewer in which all owners of abutting properties have equal rights and is maintained and controlled by the City of Fayetteville. No sewer line smaller than six (6) inches in diameter is a city sewer.

F. Service Line - The sewer which conveys the discharge from a building's plumbing system or other approved waste system to the city sanitary sewer system. The service line begins at the connection to the city sanitary sewer and ends at the building foundation.

1.03 GENERAL REQUIREMENTS

A. As specified elsewhere within these Specifications.

1.04 QUALITY ASSURANCE

A. Inspect all service lines per Section 5200 - Inspection and Testing of Sanitary Sewer Pipelines, Manholes, and Service Lines.

1.05 ADDITIONAL REQUIREMENTS

A. SHALLOW BURY

Ductile iron pipe for sewer shall be required when the existing grade or the proposed finish grade, whichever is less, provides less than 36 inches of cover. The ductile iron pipe shall extend from manhole to manhole. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

B. MAXIMUM DEPTH BURY PVC

The maximum depth of bury for PVC pipe is sixteen (16) feet. Any depths greater than sixteen (16) feet require ductile iron pipe. The ductile iron pipe shall extend from manhole to manhole. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

C. PIERS AND AERIAL CROSSINGS

1. Aerial crossings and sewer pipe on piers shall be encased.

2. Aerial crossings, sewer pipe on piers and piers shall be designed by the Engineer of Record for the specific project and included within the project documents submitted to the City for review and approval.

3. Install concrete piers as indicated on the approved plans and per Section 3600 - Cast-In-Place Concrete.

D. GRADES EXCEEDING 15%

1. Whenever the grade of the sewer line exceeds 15% (percent), ductile iron pipe shall be required. The ductile iron pipe shall meet the requirements of Section 3000 – Sewer Pipe, Fittings, and Materials, of these Specifications.

2. Sewers on 15 percent pipe slope or greater shall be anchored securely with concrete anchors in accordance with the Water Standard details prepared by the City of Fayetteville Engineering Division and spaced as follows:

1. Not over 36 feet center to center on grades 15 percent and up to 35 percent.

2. Not over 24 feet center to center on grades 35 percent and up to 50 percent.

3. Not over 16 feet center to center on grades 50 percent and over.

4. Anchor collars should be placed on downstream side of bell.
Where no bell is available, a retainer gland shall be installed.

E. COLD WEATHER INSTALLATION

1. The City reserves the right to order pipe installation discontinued whenever, in its opinion, there is danger of the quality of work being impaired because of cold weather. The Contractor shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints. Do not lay any pipe on frozen ground. No flexible or semi-rigid pipe shall be laid when the air temperature is less than 32° F unless proper precautions per the manufacturer's recommendations are taken by the Contractor and the method is approved by the Engineer and City.

2. When pipes with rubber gaskets or resilient-type joints are to be laid in cold weather, sufficiently warm the gasket or joint material so as to facilitate making a proper joint.

D. Reinforced Flexible Rubber Couplings

1. Install reinforced flexible rubber coupling only where dissimilar pipe materials are connected.

2. Take care that proper alignment is maintained and a maximum spacing between pipes does not exceed one-half inch.

3. Encase reinforced flexible rubber coupling in Class 1 concrete as shown on the City Engineering Standard Details.

PART 2 - PRODUCTS

A. Specified elsewhere within these Standards.

PART 3 – EXECUTION

3.01 WYE FITTINGS FOR SERVICE CONNECTIONS

A. Use in-line wye fittings for all service connections except on ductile iron pipe and polyethylene pipe.

B. The wye material and joint type must match that of the mainline pipe.

C. Use taps instead of wyes only on ductile iron pipe and polyethylene pipe.

D. Install wye branches at the location of live services or as indicated on the construction plans. Install wye connections for services in accordance with the manufacturer's recommendations.

E. Place Class "1" concrete under each wye branch to prevent cracking or twisting under earth loads.

F. Mark wyes for future connections using marking tape, tracer wire, yellow nylon rope, and 1/2" x 4' rebar or fence tee-post.

G. Terminate wyes for future connections in a bell suitable for connection of a four-inch SCH-40 PVC service line. Securely plug all wyes and service stubs for future connections.

H. For Service Wye Details, see the City Engineering Standard Detail Drawings.

3.02 CLEANOUTS FOR SERVICE CONNECTIONS

A. Install cleanouts on service lines at the property line where the main line is in the paved right-of-way, as required by plumbing code, or as indicated on the construction plans and as further specified in Section 3200.

B. For Cleanout Details, see the City Engineering Standard Detail Drawings.

3.03 BACKFILLING AND INSPECTION

A. Before backfilling, place concrete encasement at transitions between different types of pipe and around all flexible rubber couplings as shown on the Drawings. Use Class 1 concrete per Section 3600-Cast-In-Place Concrete.

B. Before backfilling, install concrete anchor collars in accordance with the City Engineering or project specific details at the location and interval and shown on the Drawings. Use Class 1 concrete and reinforce with steel bars per Section 3600-Cast-In-Place Concrete.

C. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting.

D. Test the pipeline per Section 5200-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

E. Repair all pavements per Section 6000-Pavement Repair.

F. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

G. Repair sodded and grass areas to original condition.

3.04 CONNECTION OF NEW SEWER LINES TO EXISTING SEWER LINES

A. Construct, clean, test, and obtain City's approval for sewer lines and manholes before connecting new sewer lines to the existing sewer.

B. If, in the opinion of the Engineer, conditions exist which require connection prior to final line acceptance, plug all lines entering the manhole connecting to the existing system until the new system is accepted. In addition, plug the line leaving the first manhole upstream. Never allow water being used to flush the new lines to enter the existing system.

C. All new sewer lines must connect to the existing system at a new or existing manhole. If a new manhole is built over an existing sewer line, do not break out the top of the existing pipe until the new line is accepted. If existing sewer line is not PVC or DIP, replace section of line first per City Engineering details.

D. If a new sewer line is to discharge into an existing manhole, divert the sewage flow around the existing manhole while the tie-in is under construction. Intercept the sewage flow at the existing manhole first upstream from the tie-in construction. Provide suitable pumping equipment and re-routing conduit to pump the sewage around the tie-in construction. Discharge into an appropriate manhole downstream from the construction.

E. Connection to an existing manhole shall be made by core drilling. A concrete manhole adapter shall be installed on the sewer pipe, and the annular space grouted in accordance to Section 3300 – Manholes.

F. Connect new sewer lines to existing manholes in a neat, workmanlike manner, to ensure a watertight connection.

3.05 GRAVITY SEWER LINE INSTALLATION – LIVE SEWER LINES AND POINT REPAIRS

A. Install sewer lines and point repairs as detailed above for new sewer lines with the following exceptions:

1. Divert all upstream flow around the section to be replaced with plugs or pumps. The bedding must be kept dry during installation. If trench bottom is too wet, excavate wet portion and replace with bedding material.

2. Make transitions to original pipe using materials and procedures specified. Take care that replacement pipe is aligned properly with no offsets. Install concrete encasement around transitions. Take care that no concrete from the encasement enters the existing pipeline. If this occurs, remove the concrete.

3. At the end of each day's work, and when for any reason the laying of pipe will be discontinued for an appreciable period, place a temporary section of pipe in the live line.

4. Pressure testing is not required. Visual and television testing are required.

5. Mandrel testing is required.

6. Service line pressure testing is not required.

7. A temporary debris catcher, as shown in the City Engineering Standard Detail Drawings, shall be used in the downstream manhole.

3.06 FORCE MAIN PIPE INSTALLATION

A. Install all pipe and fittings to the line and grade as detailed on the Drawings. All bolted valves, fittings, etc. shall be installed the same as water lines. Refer to Section 4100.

B. The force main shall have tape marked sewer wrapped around the pipe with complete revolutions not to exceed six feet (6'). Tape marked sewer shall also be installed in the trench 18" above the top of the sewer force main.

C. Remove all dirt and other foreign matter from the inside of pipe and fittings before they are lowered into the trench. Keep pipe and fittings clean during and after laying. Take care to keep dirt out of the bells. Plug all pipe openings at the end of each day's work or when pipe laying is discontinued.

D. Use proper equipment for lowering sections of pipe into trenches. Lower pipe carefully into the trench so the spigot and bell will not become contaminated.

E. Cut pipe in a neat and workmanlike manner without damage to pipe or pipe lining when trimming joint length.

F. Install pipe with bell ends facing in the direction of laying. Face bells upgrade on lines on an appreciable slope.

G. When necessary to deflect pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, the pipe may be deflected in the joint the least of the manufacturer's recommendations, or a maximum of one degree (1°) (equal to 4 inches per 20 feet).

H. Pipe barrel bending shall not be allowed.

I. Before backfilling, install concrete thrust blocking and anchor collars in accordance with the project specific and/or City Engineering Standard Details on Plans and in accordance with SECTION 4100 Installation of Water Pipe, Fittings and Materials. Thrust blocking shall be designed based on pressures of at least 25 percent greater than the maximum pump design shutoff head plus a water hammer allowance with an appropriate factor of safety.

J. All force mains shall be equipped with a Pig Launch & Retrieval System. Refer to City Engineering Standard Details.

K. Sewer line pipeline markers shall be installed beside all manholes and valve boxes that are located in easements and backyards. Manholes and valve boxes located in front yards and in streets do not require markers.

L. Test the pipeline per Section 5200-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

M. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting. Repair all pavements per Section 6000-Pavement Repair. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

N. Repair sodded and grass areas to original condition.

3.07 WATER LINE CROSSINGS

A. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

B. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

C. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. If the water main passes under the sewer main, 18-inches of clearance is still required between pipes. Refer to Section 3400 – Steel Encasement Pipe.

3.08 STORM SEWER CROSSINGS

A. For maintenance purposes, sanitary sewers will be encased in steel encasement pipe wherever the sanitary sewer crosses significant utilities, significant drainage way(s), or other significant obstacles as determined by the design provided by the Engineer of Record or as requested by the designated City engineer.

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END OF SECTION 3100

SECTION 3200 INSTALLATION OF SEWER SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers:

1. Installation of sanitary sewer service lines.

2. Point repairs on existing sanitary sewer service lines.

1.02 DEFINITIONS

A. City Sewer Main - A public sanitary sewer in which all owners of abutting properties have equal rights and is maintained and controlled by the City of Fayetteville. No sewer line smaller than six (6) inches in diameter is a city sewer.

B. Service Line - The sewer which conveys the discharge from a building's plumbing system or other approved waste system to the city sanitary sewer system. The service line begins at the connection to the city sanitary sewer and ends at the building foundation.

1.03 GENERAL REQUIREMENTS

A. Comply with the Arkansas Plumbing Code, the City of Fayetteville Codes and requirements and as specified elsewhere within these Specifications.

1.04 QUALITY ASSURANCE

A. Inspect all service lines per Section 5200 - Inspection and Testing of Sanitary Sewer Pipelines, Manholes, and Service Lines.

1.05 REFERENCES

A. Arkansas State Plumbing Code.

B. City of Fayetteville Ordinance Chapter 173 BUILDING REGULATIONS including but not limited to 173.06 Plumbing Code.

PART 2 - PRODUCTS

A. Specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 ADDITIONAL REQUIREMENTS

A. Bends

1. Avoid using short radius ninety degree bends on 4" service lines.
2. Use only long sweep bends where bends are absolutely necessary.

B. Cleanouts

1. At the building foundation.
2. On lines longer than one hundred (100) feet, cleanouts are required at one hundred (100) foot spacing.
3. Install cleanouts adjacent to any ninety degree bend.
4. Install pipe on cleanout riser up to finish grade.
5. The cleanout shall be the same diameter as the pipe on which it is installed.
6. On a case-by-case basis, the City may require a 6-inch thick, 24-inch square concrete collar to be poured around a sewer cleanout for protection in greenspaces.
7. On a case-by-case basis, the City may require a below-grade cleanout with protective vault (Utility Defender or approved equal).

C. Backwater Traps (Sewage check valve)

1. Provide backwater traps as required by Section 715 – Backwater Valves of the Arkansas Plumbing Code or as shown on the Drawings.
2. Place backwater traps in a meter box to allow periodic servicing.

D. Aerial Crossings and Piers

1. Comply with Section 3100.

E. Service line installation.

1. Lay the service line on a straight alignment and at a constant slope. Install pipe at a minimum slope of one percent (1.00%); this equal's one-eighth inch fall per lineal foot (1/8" / LF).

2. Install bends on 4" service lines at all changes in alignment and slope. Cleanouts are required at 90 degree bends and every 100 feet on lines longer than 100 feet. Bends on 6" and larger service lines are only permitted within 5 feet of the building foundation and 2 feet of the manhole being connected to; if longer than 150 feet, bends are not allowed and manholes must be built.

3. "No-Hub" type pipe connections are not permitted.

F. Reinforced Flexible Rubber Couplings

1. Install a reinforced flexible rubber coupling only where dissimilar pipe materials are mated.
2. Take care that proper alignment is maintained.
3. Encase reinforced flexible rubber coupling in Class 1 concrete as shown on the City Engineering Standard Details.

G. Tracer wire shall be installed from the public main to the building foundation and as further specified elsewhere.

3.02 SERVICE LINE CONNECTIONS TO CITY SEWER PIPELINES

A. Wye connection - Use existing wye or other prefabricated outlet if one has been left in the city sewer for sewer service to a lot unless it can be shown that the dwelling unit or building cannot drain by gravity to the wye.

B. Taps

1. Where a wye or other prefabricated outlet in the city sewer is not available to serve a lot, a tap connection shall be installed at a location approved by the City to connect the building sewer to the city sewer.
2. The City shall install all taps using approved materials and equipment after the tap fee has been paid.

C. Manhole Taps

1. Manhole taps are only permitted on end-of-line manholes. Make manhole tap connections into existing manholes as indicated on the Drawings.
2. Install manhole taps no more than twenty-four (24) inches above the manhole invert.
3. Make manhole tap watertight and flush with inside surface of manhole.
4. Manhole taps are considered as part of the service line and are subject to inspection.

3.03 SERVICE LINE REPLACEMENT/REPAIRS

A. Obtain permit per City of Fayetteville requirements.

B. When possible, the existing tap or wye should be used to connect a repaired or replaced service line.

C. When the existing wye or tap cannot be used, then the Contractor shall seal original wye or tap (to prevent entrance or rainwater or debris into the city sewer) and contact the City of Fayetteville to arrange for inspection of seal.

D. Repair damaged portion in accordance with these specifications.

E. If reinforced flexible rubber couplings are required, be sure to encase them in Class 1 Concrete as shown in the City Engineering Standard Details.

F. Contact the City of Fayetteville to arrange for inspection of service line repair.

3.04 RELOCATE SERVICE EXIT

A. Obtain Plumbing Permit from the City of Fayetteville.

B. Relocate where the sanitary sewer line exits the structure and plug the old sewer line where it was cut to be rerouted.

C. Coordinate the inspection of the work with the City Plumbing Inspector.

END OF SECTION 3200

SECTION 3300 MANHOLES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the materials and procedures used in the construction and repair of sanitary sewer manholes.

1.02 SUBMITTALS

A. Furnish Shop Drawings and Submittal Data for approval prior to the delivery of any pre-cast manhole sections.

B. Submit all materials for approval.

1.03 MANHOLE DIMENSIONS AND LAYOUT

A. The required dimensions on manholes are:

1. Cone section height: 24 inches, minimum; 36 inches, maximum.

2. Throat section height: 18 inches, maximum.

B. Locate the manhole so the centerlines of all pipelines entering and leaving pass through the center of the manhole.

C. The following are minimum manhole diameters for sanitary sewers entering/exiting a manhole at the following range of angles:

MANHOLE DIAMETERS

Pipe Size	Pipes Entering/Leaving at 0° - 45° Bend	Pipes Entering/Leaving at 45° - 90° Bend
8” - 15”	48”	48”
16” - 30”	60”	60”
33” - 42”	72”	72”

PART 2 - PRODUCTS

2.01 WATER FOR MORTAR AND GROUT

A. Water: Potable water free from injurious amounts of acids, alkalis, oils, sewage, vegetable matter, and dirt.

2.02 CEMENT

A. Portland Cement, conforming to AASHTO M 85, Type I.

2.03 MANHOLE GROUT

A. Cementitious non-shrink grout for use in manholes shall be one specially formulated for stopping active infiltration and filling voids in manholes and similar locations. Grout mix shall provide a quick-setting, volume-stable, cementitious product suitable for patching the interior of manholes when mixed and applied according to the manufacturer's recommendations. Grout mix shall be Strong Seal QSR.

2.04 CAST-IN-PLACE MANHOLES

A. Construct with Class 1 concrete only as outlined in Section 3600 - Cast-In-Place Concrete.

B. Reinforcement shall be as outlined in Section 3600 - Cast-In-Place Concrete.

C. The frame for the cover shall be installed when the manhole is constructed.

2.05 PRECAST CONCRETE MANHOLES

A. Conform to the latest requirements of ASTM C478.

B. Never transport sections to the site until they have achieved a minimum strength of 3,200 psi (80% of 4,000 psi design) as determined by a concrete cylinder test for the concrete batch.

C. Mark each piece plainly with manhole numbers and date of manufacture so it can be installed in the proper location, as shown on the plans.

D. Make sure factory-installed cutouts in the bottom section are appropriate for the pipe being laid.

E. Pipe connections at manhole - Cutouts should be equipped with rubber boots to ensure a watertight connection. Material shall be A-Lok compression connector or A-Lok G3 Boot System, as manufactured by A-Lok Products, Inc.

F. Joint Sealant - Flexible rubber sealant for joints in pre-cast manhole sections shall provide permanently flexible watertight joints, shall remain workable over a wide temperature range and shall not shrink, harden or oxidize upon aging. Material shall be RFS Prelubricated Gaskets by Press-Seal Gasket Corporation and shall meet ASTM C 443 and ASTM C 1619 (Classes C and E) requirements.

G. No supplemental joint sealant material is permitted.

H. All manhole joints shall be sealed with a 9-inch wide butyl external joint wrap material. Material shall be Infi-Shield® Gator Wrap by Sealing Systems, Inc.

I. The frame for the cover shall be installed after the cone section is installed in the field.

1. Joint surfaces between the frame, adjustments, and cone section shall be free of dirt, stones, debris, and voids to ensure a watertight seal. Place a flexible butyl gasket joint material, E-Z STIK as manufactured by Press-Seal Gasket Corporation, minimum 1/2 inch thick, in two concentric rings along the inside and outside edge of each joint. Position the butt joint for each length of joint material on opposite sides of the manhole. No steel shims, wood, stones, or any material not specifically accepted by the Engineer may be used to obtain final surface elevation of the manhole frame.

2. All grade adjustments, the exterior surfaces of the frame base, and four inches below the top of the manhole cone shall be cleaned with a wire brush and then waterproofed with trowelable bitumastic gasket material, Trowelable EZ-STIK #3 as manufactured by Press-Seal Gasket Corporation, or equal, in accordance with the manufacturer's specifications. A protective polyethylene cover shall be placed over the waterproofing material when backfilling, following sealing of the frame to the manhole. Trowelable bitumastic gasket material is not required if no grade adjustment rings are used.

3. When grade adjustment rings are placed on the manhole structure to obtain proper grade, no more than 18 vertical inches from the top of the frame to the top of the manhole cone may be used.

J. <u>REJECTION OF PRECAST MANHOLE SECTIONS</u>

Precast reinforced concrete manholes, risers and tops shall be subject to rejection for failure to conform to any of the following specification requirements:

1. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint;
2. Defects that indicate imperfect proportioning, mixing and molding;
3. Surface defects indicating honeycombed or open texture;
4. Damaged ends, where such damage would prevent making a satisfactory joint;
5. Infiltration into manhole exceeding allowed limits;
6. The internal diameter of the manhole section shall not vary more than one (1) percent from the nominal diameter;
7. Not clearly marked date of manufacturer, trade name, size designation part number, and ASTM number;
8. Having a deviation more than 1/4" from the straight edge at any point across the top of manhole cone section or riser ring; and/or
9. Having any visible steel bars along inside or outside surface of the manhole except for reinforcement stirrups or spacers used to position the cage during manufacture.

2.06 CORROSION PROTECTION

A. Manholes located on 15-inch and larger sewer lines shall be epoxy coated on the interior.

B. Manholes on sewer lines within 100 feet of a 15-inch and larger sewer line shall be epoxy coated on the interior.

C. The products shall only be applied by personnel thoroughly familiar with handling of the coating material, and in accordance with the manufacturer's specifications, recommendations and requirements.

1. Raven Ultra High-Build Epoxy Coating, designated as Raven 405, with an average thickness of 100 mils and a minimum thickness of 80 mils.

2. Warren Environmental Systems, designated as S-301, with an average thickness of 100 mils and a minimum thickness of 80 mils.

3. Tnemec Permasheild series systems may be submitted by the Engineer of Record for City review and approval.

3. All epoxies shall meet the following minimum requirements:

Flexural Strength	ASTM D790	6,000 psi
Compressive Strength	ASTM D695	8,000 psi
Tensile Strength	ASTM D638	4,000 psi
Tensile Elongation	ASTM D638	4%
Adhesion	ASTM D4541	Concrete Substrate Failure

D. Any damage to an epoxy system on existing manholes shall be repaired by the City at the expense of the contractor.

E. The installation of the interior manhole corrosion epoxy for Capital Improvement Projects shall be a separate pay item further defined in the subsequent measurement and payment specifications prepared by the Engineer of Record.

2.07 MANHOLE DROP

A. Drop on the outside of the manhole: Concrete encased PVC pipe and fittings as specified in Section 3000 – Sewer Pipe, Fittings, and Materials.

2.08 STANDARD MANHOLE FRAME AND COVER

A. Covers located on manholes owned by the City of Fayetteville, generally within the Fayetteville City Limits, shall have the words FAYETTEVILLE ARKANSAS SANITARY

SEWER and PERMIT REQUIRED CONFINED SPACE cast in the top. Also, include two closed pick holes in top side of cover.

B. Covers located on manholes operated and maintained by the City of Fayetteville, generally outside the Fayetteville City Limits, shall have the words SANITARY SEWER and PERMIT REQUIRED CONFINED SPACE cast in the top. Also, include two closed pick holes in top side of cover.

C. Minimum combined weights of the manhole frame and cover is 210 pounds. Minimum cover weight is 110 pounds. Minimum frame weight is 100 pounds.

D. All casting shall be Traffic- rated meeting the requirements of AASHTO M306 latest edition proof load representing a 2.5 safety factor over H-20 and HS-20 loading.

E. All castings shall be cast with the approved foundry's name, manufacturing foundry mark, part number, and production date in mm/dd/yy format. All castings shall be manufactured in the USA and shall be clearly marked "Made in USA."

F. All castings: Free from porosity, blowholes, hard spots, shrinkage, distortion and other defects; smooth and well cleaned by sandblasting; manufactured true to pattern.

G. Frame and cover dimensions: Refer also to the City Engineering Standard Detail Drawings. Final casting dimensions may vary one-half the maximum shrinkage possessed by the metal or no more than +/- 1/16 inch per foot.

H. Cover and frame bearing surface: smooth finish, non-rocking design or machined bearing surfaces to prevent rocking and rattling under traffic.

I. Cast Iron: ASTM A 48, Class 35B.

J. Ductile Iron: ASTM A 536, Grade 80-55-06.

K. Approved manufacturers East Jordan Iron Works and Neenah/Deeter Foundry.

K. If requested by the City, manholes shall be provided with composite (non-metallic) ring and lid to avoid corrosion. Exact product must be reviewed and approved prior to installation, on a case-by-case basis. Lid must be capable of locking shut and have metal tracing element.

2.09 HINGED AND GASKETED MANHOLE FRAME AND COVER

A. Manhole frame shall be cast or ductile iron. Manhole cover shall be ductile iron. Seal shall be by replaceable t-gasket. T-gaskets are required.

B. Covers located on manholes owned by the City of Fayetteville, generally within the Fayetteville City Limits, shall have the words FAYETTEVILLE ARKANSAS SANITARY

SEWER and PERMIT REQUIRED CONFINED SPACE, or CONFINED SPACE ENTRY PERMIT REQUIRED cast in the top.

C. Covers located on manholes operated and maintained by the City of Fayetteville, generally outside the Fayetteville City Limits, shall have the words SANITARY SEWER and PERMIT REQUIRED CONFINED SPACE or CONFINED SPACE ENTRY PERMIT REQUIRED cast in the top.

D. Hinged and gasketed manhole frame and cover shall open to, or past, 90° and have a safety stop at 90°.

E. All casting shall be Traffic- rated meeting the requirements of AASHTO M306 latest edition proof load representing a 2.5 safety factor over H-20 and HS-20 loading.

F. All castings shall be cast with the approved foundry's name, manufacturing foundry mark, part number, and production date in mm/dd/yy format. All castings shall be manufactured in the USA and shall be clearly marked "Made in USA."

G. All castings: Free from porosity, blowholes, hard spots, shrinkage, distortion and other defects; smooth and well cleaned by sandblasting; manufactured true to pattern.

H. Frame and cover dimensions: Refer to the City Engineering Standard Detail Drawings for EJIW, Neenah similar. Final casting dimensions may vary one-half the maximum shrinkage possessed by the metal or no more than +/- 1/16 inch per foot.

I. Cover and frame bearing surface: smooth finish, non-rocking design or machined bearing surfaces to prevent rocking and rattling under traffic.

J. Cast Iron: ASTM A 48, Class 35B.

K. Ductile Iron: ASTM A 536, Grade 80-55-06.

L. Frame shall be anchored to the manhole cone per the City Engineering Standard Detail.

M. Approved products are East Jordan Iron Works Ergo and Neenah Liftmate.

2.10 MANHOLE STEPS

A. Manhole steps shall NOT be installed in any manholes.

2.11 RUBBER WATERSTOP GASKETS

A. Waterstop gaskets shall be required at **ALL** manhole connections. Manhole seals shall be concrete manhole adapter by Fernco, A-Lok, or approved equal.

2.12 MANHOLE RISER RING

A. Manhole riser rings shall be compatible with the size and type of manhole cover with which it will be used.

B. A maximum of 6 inches of riser rings shall be permitted. Adjustments greater than 6 inches will require grade adjustment rings.

2.13 MANHOLE GRADE ADJUSTMENT RINGS

A. Grade adjustment rings shall be required to adjust the frame and cover to grade as required.

B. Sloped grade adjustment rings may be required to match the slope of paved areas.

C. Grade adjustment rings shall be concrete or injection molded, recycled HDPE as manufactured by Ladtech, Inc.

2.14 RAIN STOPPERS (MANHOLE INSERT)

Rain stoppers shall be installed in all manholes that are located on 15-inch and larger sewer mains when such manholes do not utilize hinged covers complete with gaskets.

Rain stoppers shall be installed in other manholes in locations subject to inflow and infiltration as directed by the City's Utilities Director.

A. Polyethylene Insert

1. The manhole insert shall be of corrosion-proof high density polyethylene that meets or exceeds the requirements of ASTM D1248, Category 5, Type III with a minimum impact brittleness temperature of -180°F.
2. The minimum thickness of the manhole insert shall be 3/16".
3. The manhole insert shall have a strap for removing the insert. The strap shall be made of minimum 1" wide woven polypropylene or nylon webbing, with the ends treated to prevent unraveling, Stainless steel hardware shall be used to securely attach strap to the insert.
4. The manhole insert shall have one or more vent holes or valves to release gases and allow water inflow at a rate no greater than 5 gallons per 24 hours. The valve shall be installed by the manufacturer at the factory.
5. There shall be a minimum 10-year warranty on the body of the dish and a 5-year warranty on all other parts of the insert.
6. The insert shall have proof of durability in traffic impact loads and shall have an Engineer certified proof test passing H-20 loading.

B. Stainless Steel

1. Stainless steel inserts shall be installed at locations with pipe size diameters of outfalls 15 inches or greater where a hinged/gasketed lid is not present.

2. Insert shall be 304 stainless steel.
3. The manhole insert shall be as manufactured by “No Flow In FLOW” located in San Antonio, Texas.

PART 3 - EXECUTION

3.01 MANHOLES – GENERAL

A. Perform excavation and prepare base area in accordance with Section 2300 - Excavation, Backfilling, and Compacting.

B. Never install base in a water filled excavation.

C. Place base per the City Engineering Standard Detail Drawings and Section 3600 - Cast-In-Place Concrete. Extend base a minimum of six inches beyond finished sides of manhole.

D. Extend all pipes entirely through the manhole wall so that a joint occurs no closer than 24 inches outside the manhole wall.

E. Pipe installed for future extensions shall have one full joint of pipe installed.

F. After manhole is constructed, wait no less than 48 hours, then backfill per Section 2300 - Excavation, Backfilling, and Compacting.

3.02 CAST-IN-PLACE MANHOLES

A. Dimension and layout: Per City of Fayetteville Engineering Detail Drawings and Tables. The top section or cone must be concentric with the barrel unless otherwise noted.

B. The frame shall be set in accordance with City of Fayetteville Engineering Details. The frame shall be installed to match the slope of paved areas.

C. Install rubber waterstop gaskets in the walls around all pipes.

D. Interior finish: Smooth, free of fins or sharp edges.

E. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

F. Care should be taken to prevent the end of the pipe from deflecting, due to loads imposed by the weight of the concrete.

G. Construction joints on manholes of excessive depth shall be connected with reinforcement approved by the Engineer.

3.03 PRECAST MANHOLES

A. Dimension and layout: Per City Engineering Detail Drawings. The top section or cone must be concentric with the barrel unless otherwise noted.

B. The bottom section for pre-cast manholes shall be manufactured as an integral part of the manhole base slab.

C. Install remaining sections in a truly vertical plane.

D. The frame shall be set in accordance with City Engineering Details. The frame shall be installed to match the slope of paved areas. In greenspaces, grout around the outside of frame per standard details.

E. Fill space between pipe and periphery of cutout on the interior of the manhole with non-shrink grout from the bottom of the invert to the spring line of the sewer pipe (1/2 pipe depth).

F. Grout joints between sections, interior only.

G. Interior finish: smooth, free of fins or sharp edges.

H. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

I. Grout and/or plug lifting holes for manholes.

J. All manhole joints shall be sealed with an external joint wrap material.

3.04 DROP MANHOLES

A. Install a drop manhole when the vertical difference between the pipe entering and leaving the manhole exceeds two (2) feet.

B. Construct manhole base, barrel, and top per the requirements for cast-in-place or pre-cast manholes.

C. Construct drop of PVC pipe and fittings per City Engineering Standard Details.

D. Encase the pipe and fittings in Class 1 concrete as per City Engineering Standard Details.

3.05 MANHOLE FRAME AND COVER

A. Set the manhole frame for Cast-In-Place manholes in Class 1 concrete as shown on the Standard Details as an integral part of the manhole construction.

B. Set manhole frame and cover top level and to the elevation shown on the Drawings. In public rights-of-way, set the ring and cover flush with pavements, sidewalks, or other paved surfaced areas.

3.06 MANHOLE INVERT

A. Invert depth at the flow line: the same as the pipe diameter.

B. In curved inverts, make curves with the longest possible radius to facilitate smooth flow and the insertion of cleaning and televising equipment.

C. Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed from the center of the manhole to the outlet pipe in the shape of a "U" as shown in the City Engineering Standard Details.

D. Invert materials and finish: Class 1 Concrete, smooth finish.

E. Invert grade: Constant, smooth grade; no offsets.

F. Bench: Slope grout upward from the edge of the invert to the manhole wall.

G. Form a flow channel in the bench for any services stubbed into manhole. Form invert and finish per above.

H. Cut the upper half of any pipe extending inside the manhole wall flush with the wall. Smooth rough edges with grout.

3.07 MANHOLE REPAIRS

A. Make all repairs in accordance with these specifications.

B. Use manhole grout in patching around new taps.

C. Plaster all brickwork with mortar.

3.08 MANHOLE ADJUSTMENTS

A. Manhole riser rings may be used to raise manhole covers to grade.

B. Manhole riser rings shall be sealed with Adeka P-201 or Manus-Bond 75AM to create a water tight seal.

C. Adjustments greater than 6 inches will require grade adjustment rings in accordance with project specific approved details.

D. The exterior surfaces of the frame base, and four inches below the top of the manhole cone shall be cleaned with a wire brush and then waterproofed with trowelable bitumastic gasket material, Trowelable EZ-STIK #3 as manufactured by Press-Seal Gasket Corporation, 9-inch wide butyl external joint wrap material in accordance with the manufacturer's specifications. A protective polyethylene cover shall be placed over the trowelable waterproofing material when backfilling, following sealing of the frame to the manhole.

E. The throat section height shall not exceed 18 inches. The throat section shall be defined as the distance from the bottom of the integral cast manhole ring to the top of the manhole cover.

F. If a manhole cannot be raised to grade using riser rings or grade adjustment rings then the manhole must be cut-off below the existing cone section and raised to grade using cast-in-place methods. A 1-inch square keyway shall be cut into the cold joint surface, and #4 rebar placed every 12-inches around circumference of cold joint. The rebar shall be doweled and epoxied 6-inch depth in to existing manhole and 6-inches into new poured section. See standard details.

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END OF SECTION 3300

SECTION 3400 BORES AND STEEL ENCASEMENT PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide encasement pipe jacked through bored tunnel for crossing of utility pipe lines under roadways, railroads and at other locations as indicated on the approved drawings.

B. Provide encasement pipe by open cut construction where shown on the Drawings.

C. Pulling or jacking carrier pipe through encasement pipe.

D. Providing end seals at ends of encasement pipe.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A139 Specification for Electric-Fusion (Arc) - Welded Steel Pipe (sizes 4" and over).

2. ASTM A211 Specifications for Spiral-welded Steel or Iron Pipe.

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Encasement pipe: Smooth wall steel pipe conforming to ASTM A-53 / ASTM A283 / ASTM A-135, Grade B, CW, physical tests only (no hydrostatic test required). The pipe shall have beveled ends prepared for welded joints. The pipe steel shall have a minimum yield strength of 35,000 psi.

B. Welding materials: Type required for materials being welded and conforming to applicable AWS Specifications.

C. Grout: Cementitious grout shall consist of a preblend of lightweight aggregate, cement, fly ash and admix to prevent segregation and promote expansion upon setting. Loose bulk density for the dry mix materials shall be 30 to 35 pounds per cubic foot. Grout shall equal or exceed Strong-Seal Grout 250 - Product Code 2133 and shall be packaged in 2 cubic foot bags.

D. Flowable Fill: Flowable fill shall conform to Section 206 – Flowable Select Material of the Arkansas State Highway and Transportation Department's Standard Specifications for Highway Construction, latest edition.

E. Casing Spacers: Shall be stainless steel, Cascade Model CCS as manufactured by Cascade Waterworks Mfg. Co., BWM Company.

F. Casing End Seals: Casing end seals shall be watertight, interconnected mechanical-type, interior to the encasement between the encasement and carrier pipe. Casing End Seals shall be Link-Seal by GPT Industries, or Wrap-It Link by CCI Piping Systems..

G. Polyethylene Encasement: Polyethylene encasement shall be in conformance to ANSI/AWWA C105/A21.5, latest revision.

2.02 MINIMUM THICKNESS

A. The encasement pipe shall be capable of supporting all traffic and earth loads. The Contractor shall submit design calculations supporting the selection of the encasement pipe thickness used.

B. Minimum thickness for encasement shall be as follows:

Diameter of Casing Pipe	Minimum Thickness
20" OR LESS	.250"
24" – 30"	.375"
36"	.500"
48" – 60"	.625"
72"	.750"

Sizes not listed above shall be determined on an as-needed basis by the City.

C. When boring under railroad right-of-way, minimum thickness shall be determined by railroad standards.

2.03 MINIMUM DIAMETER

A. The minimum diameter for encasement pipe shall be such that the carrier pipe, along with casing spacers and joint restraints, will not bind against the inside of the encasement pipe during installation. The minimum diameter of encasement pipe shall be as follows:

Diameter of Carrier Pipe	Diameter of Encasement
2"	5"

3”	6”
4”	8”
6”	12”
8”	16”
10”	20”
12”	24”
14” – 16”	30”
18” – 20”	36”
24”	42”
30”	48”
36”	54”
42”	60”
48”	72”

3.01 EXCAVATION

A. The contractor shall inspect the location where encasement structures are to be installed and become familiar with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work.

B. The contractor shall satisfy themselves of soil conditions by means they deem necessary including but not limited to exploratory boring or exploratory pit excavations at tunnel/bore ends. All such exploratory work will be coordinated with City and the engineer of Record. All such exploratory work shall be performed in a manner not to endanger highway, railroad or street fill and embankments and shall be satisfactorily backfilled and restored.

C. Highway Bore: Do not set up equipment or begin excavating pit on state highway without written permission/permit received from the Arkansas Highway and Transportation Department District Engineer or his authorized representative.

D. Railroad Bore: Do not set up equipment or begin excavating pit on or near railroad property without written permission/permit of the respective railroad company.

E. Highway and railroad permits for Capital Improvement Projects will be obtained by the City or the City’s designated representative.

3.02 INSTALLATION, ENCASEMENT PIPE

A. General.

1. Install encasement pipe at grade and alignment shown on Drawing. Allow for height of casement spacers when establishing grade for gravity line encasement pipe. Refer to City Engineering Standard Details.

2. When indicated on the approved plans or project specifications all street, roadway and highway crossings for water or sewer pipelines installed by jacking and bore methods shall be accordance with AHTD standards.

3. Excavation of bore pits and trenches within street right-of-way, roadways or highways shall be of sufficient distance from paving to permit traffic to safely pass without interference. The Engineer of Record shall be responsible to design the location of bore pits to permit traffic to safely pass without interference.

B. Bores:

1. Excavate pits and trenches required at each side of crossing to minimum width and length indicated or necessary for boring and jacking operation and carrier pipe installation.
2. Carefully set steel guide rails in pit to attain specified grade and alignment.
3. Keep pit pumped free of standing water. Maintain pit bottom to provide stable base for rails and equipment and firm footing for workmen.
4. Provide Trench Safety/Protective Systems meeting Federal requirements and these Specifications.
5. Bore tunnel and simultaneously jack encasement pipe forward one section at a time. Connect sections by full penetration butt welding performed in accordance with AWS D1.1.
6. Remove excavated soil from boring operation as it enters pit and dispose of it offsite.
7. Voids between the encasement pipe and the surrounding soil shall be pressure filled with grout.
8. Cathodic protection shall be installed on the steel encasement pipe. Use 17# HP magnesium anodes bonded to the steel encasement pipe.
9. End seal shall be installed after the carrier pipe has been installed.

C. Open Cut:

1. Excavate trench as required.
2. Steel encasement pipe shall be installed, bedded, and backfilled the same as ductile iron pipe.
3. Steel encasement pipe shall be double poly wrapped.
4. Cathodic protection shall be installed on the steel encasement pipe. Use 17# HP magnesium anodes bonded to the steel encasement pipe.
5. End seal shall be installed after the carrier pipe has been installed.

3.03 INSTALLATION, CARRIER PIPE

A. Joint pipe as specified in Section 3100 or 4100. Pull or jack carrier pipe through encasement pipe. Do not allow cables or jacks to be in direct contact with carrier pipe while pulling or jacking pipe. Use timber or padded steel member.

B. A minimum of three casing spacers shall be installed on pipe up to 20-foot pipe joints.

C. All carrier pipe installed through the encasement shall be fully restrained. Over-belling of the carrier pipe shall be prevented.

3.04 BACKFILL

A. Prior to backfill, seal ends of encasement pipe with end seal as shown in the City Engineering Standard Details.

B. Use material excavated from pit.

C. Backfill against ends of encasement pipe.

D. Backfill pit and carrier pipe in same manner as specified in Section 2300 – Excavation, Backfilling, and Compacting.

3.05 CLEANUP

A. Backfill in same manner as specified for line work in Section 2300 - Excavation, Backfilling and Compacting.

B. Cleanup and restoration as specified in Sections 6000 PAVEMENT REPAIR and 6100 LAWN AND GRASS RESTORATION.

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END OF SECTION 3400

SECTION 3500 SEWER PUMP (aka LIFT) STATIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section pertains to the minimum requirements for the design and construction of submersible type pump (aka lift) stations, which are the primary type constructed as part of private development. Sewer pump stations installed by private development will meet or exceed the minimum standards within this section and as otherwise specified within these Standards.

Comply with the "Ten States Standards" and modifications and/or additional requirements as specified herein.

Sewer pump stations, for City Capital Projects will comply with this section and any other requirements determined necessary by the Engineer of record, or Utilities Director, or the City's designated engineer. Sewer pump stations for City Capital Projects will further be considered on specific case by case basis in accordance with Section 1000 General Requirements. Approval will be project specific and requires approval from both the Utilities Director and the designated City engineer.

B. A registered Civil Engineer shall seal the civil portion of the drawings. A registered Electrical Engineer shall seal the electrical portion of the drawings. All engineers shall be registered in the State of Arkansas.

C. These Standard Specifications provide the minimum requirements for sewer pump stations. The pump station dimensions, equipment, controls, etc. will be approved only upon the submittal of plans and specifications to the City, and upon the City's written approval.

D. Pump Stations, in general, shall be submersible type pump capable of passing a 3 inch (minimum) sphere. Multiple pumps shall be provided. Where only two pumps are provided, the pumps shall be of the same size with one (pump and motor) designated as duty and one (pump and motor) designated as stand-by with each pump capable of pumping the design flow for the proposed development (including provisions for future phases of the initial proposed development) with a minimum pumping capacity of 100 gpm each under site operating conditions. Firm capacity and one minimum standby pump shall be provided, pumps shall have the capacity such that with any one pump out of service the remaining pump(s) will have the capacity to pump the design hourly flow. Further the pump station will include: wet basin, separate valve pit, valves, piping, hatches, guide rails, pump removal components, control center, level controls, remote monitor package, interconnecting electrical wiring, incoming power and communications supply, and all other features regularly and normally required as a part of a complete and functional facility. All work shall be in accordance with site requirements, details in the Drawings, the Engineer of Record's design, these Standards and the manufacturer's recommendations.

E. All Pump Stations shall be designed for and operate on 480 V, three (3) phase power. No deviation from this requirement shall be permitted without the express prior written approval of the City.

F. The station shall be equipped with a remote monitor capable of monitoring the status of the lift station and communicating with the City's existing SCADA system housed at the Noland and West Side WWTP. This system shall be purchased and installed by the City at the developer's or contractor's expense.

G. All of the mechanical and electrical equipment shall be an integral package supplied by the pump manufacturer with local representation so as to provide undivided responsibility. Pumps, motors and appurtenance mechanical and electrical equipment shall be Fairbanks Morse Pump equipment or Flygt Pump equipment and further comply with other specific requirements set forth herein and in the approved plans.

H. The Contractor shall submit to the City for review and approval three (3) sets of shop drawings, detailed specifications, pump warranty, and performance characteristics for all of the equipment and fixtures to be furnished and installed. The Shop Drawings and equipment data shall be submitted with a cover letter, Contractor’s stamp of approval, and Engineer’s stamp of approval indicating that he has reviewed, checked, and approved the data submitted. The City will review the submittal and render a decision in writing as to the acceptability of the equipment. Without prior written City approval, the item of work may not be accepted.

I. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the City prior to proceeding with the work.

J. All mounting and fastening hardware shall be stainless steel.

K. All components of the pump station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not require surface protection throughout the expected life of the lift station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP), and ultraviolet stabilized PVC.

L. All valves and ductile iron fittings shall be ceramic epoxy coated inside and out. All ductile iron piping coming in contact with wastewater or installed in the wet well, dry well or valve pit shall be coated with epoxy inside and out. Acceptable interior epoxy for ductile iron pipe shall be specifically designed for wastewater environments and shall be Tnemec Series 431 Perma-Shield, or Protecto 401 as determined by the Engineer of Record and approved by the City for the specific project.

M. All stainless steel hardware and accessories shall be protected from field applied coating of the epoxy.

N. Wet well access/hatches shall include an integral safety grate and integral safety chain/rail

system or a separate safety rail system designed by, or selected by, the engineer of Record and approved by the City.

O. Mixers. If the City determines the need for wet well mixing, then the developer's engineer shall accommodate the City's purchase and installation of the mixer and controls, wiring, hoses, and mixer appurtenances (only) within, and connected to, the developer's installed pump station.

1.02 PUMP STATION SITE

A. The pump station site shall have minimum dimensions of 50' x 50' with a maximum cross slope of 5%. The site shall be an all-weather surface consisting of asphalt or concrete. Additional site area may be required depending on the diameter and depth of the wet well and other accessories. Final dimensions of the site shall be determined by the City Engineer.

B. The City of Fayetteville must own the land, by deed and not by plat, on which sewer pump stations are located or anticipated to be constructed.

C. The pump station shall be provided with an access drive to the nearest public road. The access drive shall be an all-weather surface with a stabilized gravel base and asphalt or concrete surface. If the slope is greater than 10%, the surface shall be constructed in such a way that the surface material cannot creep down slope. The drive shall enter the public road at a curb cut.

D. The pump station site shall be secured by a minimum 6' high wooden fence. Posts shall be a minimum of 3" SCH 40 galvanized steel. Gate posts shall be a minimum of 4" SCH 40 galvanized steel. Rails shall be 16-gauge aluminum or galvanized steel, 2" x 4" nominal dimensions. Pressure treated wood shall be installed in the rails to anchor the pickets. All pickets shall be constructed of cedar, and shall be a minimum of 1"x6"x6'. All hardware used to anchor the cedar pickets to the steel rails shall be designated for use with cedar. A 12' wide double gate with lockable hasp shall be provided.

1.03 OPERATING CONDITIONS

A. The characteristics and operating conditions of the lift station and pumps shall be provided in detail as part of the ENGINEER'S design and submitted for approval to the City.

B. Prior to installation the Contractor shall submit the following information for each pump to the City for review and approval:

1. Pump capacity in gallons per minute;
2. Total dynamic head (TDH) and operating RPM; Use C=120 and C=140
3. Motor horsepower;
4. Motor rpm;
5. Motor voltage, phase and cycle;
6. Make and model number; and

7. Pump curves for the pumps to be provided.

C. Pump station acceptance will be based upon pump drawdown tests. The acceptable range is +10% and -5% of the reported pump capacity in GPM. Pump flows outside of this range will result in non-compliance of the standard and the pump station will not be accepted.

1.04 NOTES TO DESIGN ENGINEER

A. SIZING OF WET BASIN

1. The wetwell storage depth below the lowest inlet shall be a minimum of 5'-0" and shall also meet the following criteria:

   a. All pumps OFF shall be set at the pump manufacturer's recommended level but no less than 1'-6" from the bottom of the wet well.

   b. The distance between all pumps OFF and the lead pump ON shall be set to provide storage capacity equal to:

$$\frac{15 \times \text{RATED PUMP GPM}}{4}$$

   (i.e. 15 minute cycle minimum)

   c. Designs utilizing multiple pumps will include the lag pump ON set a minimum of 6" above the lead pump ON and a minimum of 12" below the lowest inlet invert.

   d. The high water alarm float shall be set a minimum of 6" above the lag pump ON and minimum of 6" below the lowest inlet invert.

   e. All level control elevations shall be set below the lowest inlet invert.

1.05 SMALL DIAMETER PRESSURE SEWERS

A. Small diameter pressure sewer systems are not permitted as a Standard Specification.

B. Small diameter pressure sewer systems will be considered on specific case by case basis in accordance with Sections 1000 1.01 B and 1000 1.07 A. Approval will be project specific and requires approval from the Utilities Director.

1.06 PUMP STATION WARRANTY

A. Pump station warranty shall be two (2) years from the date of acceptance per City maintenance bond requirements.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

A. Pumps shall be of the submersible type for handling raw unscreened sewage. Pump volute, motor and seal housing are to be high quality gray cast iron. Impeller shall be either cast iron or cast bronze of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge, and other matter found in normal sewage applications. Impeller shall have pump-out vanes on the back shroud of the impeller to keep pumped material away from the seal area and increase operating life. Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. The pump volute shall be fit with a replaceable bronze wear ring to minimize wear on the impeller and help achieve longer balanced operating life. All fasteners shall be of stainless steel.

B. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.

C. The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

D. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

E. The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be Class H with maximum temperature capability of 155EC. Motor housing shall be filled with a high dielectric oil to give superior heat transfer and allow the bearing to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump should not require cooling water jackets. Stator shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or press. Shaft shall be of stainless steel and supported by ball bearings. Motor shall be provided with

heat sensing units attached to the motor windings which shall be connected to the control panel to shut down pump if overheating occurs.

F. Pump motor cable and heat sensor/seal failure sensor cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Cable of the proper length shall be provided to eliminate need for splices or junction boxes between pump and "control center". The cable shall enter the motor through a cord cap assembly which is double sealed allowing disassembly and disconnect of the wires and the motor and still not damage the sealed characteristics of the motor housing. Each individual conductor shall be color coded in accordance with generally accepted industry standards. The color coding shall designate the application of the conductor.

G. The pump mounting base shall include adjustable guide rail supports and a discharge connection with a one hundred twenty-five (125) pound standard flange. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc.

H. A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall not require a man to enter the wetwell to remove the pump and motor assembly. Two (2) rails of two (2) inch stainless steel pipe shall be provided for each pump. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by attachment to the access hatch frame. One (1) intermediate guide rail support is required for each fifteen (15) feet of guide rail length for stainless steel pipe.

I. The pumps shall be equipped with sliding brackets or rail guides. To insure easy removal of the pumps, the rail guides attached to each pump shall not encircle the rails. A stainless steel lifting chain or manufacturer's pump removal system (Flygt Lift) of adequate length for the basin depth shall be provided for each pump. Each pump shall be equipped with a permanent, stationary lifting handle with a minimum clearance of 12" between the top of pump and bottom of handle.

J. The rails and the rail guides shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable. The actual sealing of the discharge interface may be of the metal-to-metal contact. No sealing gaskets will be permitted.

K. Pump warranty shall be provided by the pump manufacturer and shall warrant the units being supplied to the Owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted

with the approval drawings.

2.02 BASIN, VALVE PIT AND ACCESSORIES

A. The basin and valve pit are to be constructed of precast concrete meeting the requirements of ASTM C-478. Cast-in-place monolithic structures may be substituted with the prior written approval of the City. Minimum valve vault and wetwell diameter shall be 6'-0'. The actual arrangement of the structures are to be as shown in the approved Plans. The wetwell basin top shall be provided with a six (6) inch stainless steel vent having a downward pointing inlet and screen over the inlet opening.

B. The basin, valve pit, flat tops, and base slabs are to be constructed of precast or cast-in-place reinforced concrete manhole sections conforming to ASTM C-478. All joints between precast sections shall be made with an approved rubber O-Ring in accordance with ASTM C-443 and a 1/2 inch diameter non-asphaltic mastic conforming to AASHTO M-198 and Federal Specification SS-521-A. All manhole joints shall be sealed with an external joint wrap material. Material shall be 9-inch width Infi-Shield® Gator Wrap by Sealing Systems, Inc. In addition, the outside wall below grade is to be coated with bituminous waterproofing material. The top and bottom of the chambers shall be precast or may be poured in place concrete if approved by the City Engineer.

C. The wetwell pump basin and the valve pit chamber shall be enclosed at grade level with a reinforced concrete pad rectangular in shape and extending a minimum of 1'-0' from the chambers outside dimension.

D. All concrete surfaces within the wet well shall be coated with one of the products listed below. These products shall only be applied by personnel thoroughly familiar with handling of the coating material, and in accordance with the manufacturer's specifications, recommendations and requirements.

1. Raven Ultra High-Build Epoxy Coating, designated as Raven 405, with an average thickness of 100 mils and a minimum thickness of 80 mils.

2. Warren Environmental Systems, designated as S-301, with an average thickness of 100 mils and a minimum thickness of 80 mils.

3. The above epoxies shall meet the following minimum requirements:

Flexural Strength	ASTM D790	6,000 psi
Compressive Strength	ASTM D695	8,000 psi
Tensile Strength	ASTM D638	4,000 psi
Tensile Elongation	ASTM D638	4%
Adhesion	ASTM D4541	Concrete Substrate Failure

4. A Tnemec system to include Tnemec Series 434 Permashield with a topcoat of Tnemec Series 435 Perma Glaze will be reviewed on specific projects as an approved equal.

E. The pump supplier shall provide an aluminum two (2) door access hatch frame and door assembly to be installed in the concrete basin top. This door assembly shall provide access for removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, safety latch to hold door in the open position and a hasp suitable for padlock. The doors shall have a nonskid finish and be designed for light, medium, or heavy duty, depending on the location of the pumping station.

F. An aluminum single door access hatch frame and door assembly similar to the one described above shall be provided for use as entry to the valve pit. Minimum opening for the valve box entry shall be thirty-six (36) inch by thirty-six (36) inch.

G. A swing check valve with external swing arm and a full port (100% area) eccentric plug valve shall be installed in the valve pit in each pump's discharge piping. A minimum clearance of twelve (12) inches shall be allowed from the bottom of the valves to invert of the pit. A drain pipe and p-trap shall be installed to drain the valve pit back to the wet basin but not allow the wet basin liquid to enter the valve pit. In addition, a 1/2" NPT tap and ball valve shall be provided on the discharge side of the pumps past the valves to facilitate pressure readings for the pump discharge.

H. All yard piping within the pump station site shall be centrifugally cast ductile iron and shall conform to ANSI Specifications A21.51 and AWWA C-151, latest revision and shall be Pressure Class 350, 300, 250, or 200 wall thickness dependent upon site conditions. All direct buried ductile iron pipe and fittings shall be double poly-wrapped.

I. Force main pipe downstream of the pig launch structure shall be DIP or PVC in accordance with these Standards. All force main pipe shall have tracer wire installed along its entire length. Gate valves (up to 10-inch) or full-port plug valves (12-inch) shall be installed along its length, not to exceed 1000' unless a variance is approved by the City for long force mains, and shall be marked sewer. An empty valve box shall be installed in the vicinity of the discharge manhole and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. The valve box shall be marked sewer. A 2-inch SCH-40 PVC pipe shall be installed in the empty valve box. The pipe shall have a pipe marker label affixed and further labeled "No Valve, Tracer Wire Only." The force main shall have tape marked sewer wrapped around the pipe with complete revolutions not to exceed 6'. Tape marked sewer shall also be installed in the trench 18" above the top of the sewer force main.

J. Sewer line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380). All markers shall be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360) and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, SEWER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998". The label shall also include the official City Logo and be white in color with green and black lettering. The label shall be affixed to two sides of the marker. An additional white 1" wide reflective tape (3M) shall be placed

around the full circumference of the top of the marker. Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

K. All force mains shall be equipped with a pig launch within the pump station site. A fire hydrant is required to be located within 100' of the site to facilitate pigging of the force main.

2.03 GENERAL ELECTRICAL

A. A single main fusible or breaker disconnect switch of adequate size to provide power for the "control center" and its related components shall be provided by the Contractor.

B. The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON position.

C. The pump station site shall include a GFI convenience outlet with 20 amp breaker and suitable transformer or power supply to provide 110 volt single phase power to the convenience outlet.

D. A minimum four (4) inch and two (2) inch PVC schedule 40 wall conduits shall be provided from the wetwell basin to the control center which will allow the pump power cables, sensor cables and level controls to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and level controls to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.

E. A minimum three-quarter (3/4) inch and two (2) inch PVC schedule 40 wall conduits shall be provided from the valve vault to the control center for future remote monitoring of the swing check valves.

F. All vertical conduit and transitions from horizontal to vertical runs shall be rigid metallic conduit. Horizontal, below grade, conduit runs may be either Schedule 40 PVC or rigid metallic conduit.

G. All electric components shall be properly labelled per NFPA 70E requirements.

2.04 CONTROL CENTER

A. The control center shall be built in a NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. Enclosure size must be verified by City prior to ordering to ensure all components will fit properly. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel. The control center shall be located so as to provide safe access to the panel while wetwell hatch doors are opened, and shall be positioned so as not to be between the access drive and the wetwell.

B. A circuit breaker and magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts to operate both pumps on override condition. A separate circuit breaker shall be supplied for power to the control circuit. The control center shall include an extra circuit breaker of adequate size to provide 115 volt, single phase power for the remote monitor panel (PLC cabinet). The control center shall include a control voltage transformer to reduce supply voltage 115 volt, the float circuit and associated relays which shall be provided with 24 volt control voltage. A green run light and H-O-A switch shall be provided for each pump. A terminal strip shall be provided to make field connections of pump power leads, level control, seal sensor leads, heat sensor leads, and remote monitor panel interconnections.

C. The control center shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal and will automatically reconnect when condition has been corrected.

D. The control center shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.

E. The control center shall include an hour meter for each pump to register the elapsed operating time of each pump.

F. The control center shall have a high water alarm built into the main enclosure. The high water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted above the top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure. Unistrut or other means shall be used to avoid a penetration in the building for these features.

G. The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.

H. The control center shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three (3) phase sequence voltage relay shall be of the 8-pin connector type.

I. The control center shall be suitable for connection to a remote monitor package as described in the section titled "Remote Monitor Package". The main control must include the following interconnection capability:

1. Circuit breaker to power remote monitor panel as described above.
2. Relay dry contact to signal power failure to panel
3. Relay dry contact to signal phase failure

4. Relay dry contact to signal generator fault alarm
5. Relay dry contact to signal generator run status, i.e. ON or OFF
6. Relay dry contact to signal transfer switch status on utility power
7. Relay dry contact to signal transfer switch status on generator power
8. Relay dry contact to signal drywell flood (if applicable)
9. Relay dry contact to signal site or vault intrusion alarm (if applicable)
10. Relay dry contacts to signal float status in wetwell (low, lead, lag, high floats)
11. Relay dry contact to signal pump(s) HOA switch in hand
12. Relay dry contact to signal pump(s) HOA switch in automatic
13. Relay dry contact to signal pump(s) running status, i.e. ON or OFF
14. Relay dry contact to signal pump(s) tripping of the overload
15. Relay dry contact to signal pump(s) seal failure (if applicable)
16. Relay dry contact to signal pump(s) over temperature failure
17. Analog input signaling the wetwell level
18. Relay dry contacts for the PLC to call for the pump(s) to be turned ON/OFF

J. All component of the control center shall be American made and available from local sources. In particular, items such as circuit breakers, overload protection, relays, etc. shall be available and in stock by local sources.

K. Pump control shall be achieved by the use of a pressure transducer. The Controller shall be an Automation Direct Productivity 2000 with the following components:
1. Seven slot base model P2-07B
2. Power supply 110VAC model P2-01AC
3. CPU model P2-550
4. Digital input card model P2-16ND3-1 (quantity 2 for two pumps, quantity 3 for 3-4 pumps)
5. Isolated Relay output card model P2-08TRS
6. Analog input card model P2-08AD-1
7. Model P2-FILL to cover remaining open I/O cards

The Contractor will provide all hardware and wiring, City will provide PLC Software and programming.

L. In addition to the pressure transducer, a backup float system shall be provided to monitor wet well level. System should consist of low/off, lead, lag, and high-level floats and should be installed such that the system can operate the pumps in the event the pressure transducer fails or the PLC fails.

2.05 SCADA REMOTE MONITOR PACKAGE

A. The station shall be equipped with a remote monitor capable of monitoring the status of the lift station and communicating with the City's existing SCADA system housed at the Noland WWTP. This system shall be purchased and installed by the City at the developer's or contractor's expense. The costs of the SCADA system

charged to the developer or contractor will be the actual costs based on site-specific design as approved by the City.

2.06 SPARE PARTS

A. The Contractor shall supply one set of spare parts for each pump for each station, including at a minimum the following:

1. Impeller;
2. Upper seal assembly;
3. Lower seal assembly;
4. Upper bearing assembly;
5. Lower bearing assembly;
6. Wear rings; and
7. O-Rings and gaskets (two (2) sets).

2.07 OPERATION AND MAINTENANCE MANUALS

A. Three (3) operation and maintenance manuals shall be submitted to the City

B. Manuals shall include, at a minimum:

1. Operation instructions;
2. Maintenance instructions;
3. Recommended spare parts list;
4. Lubrication schedules;
5. Structural diagrams;
6. As-built wiring diagrams; and
7. Bill of materials.
8. Copy of design engineer's pump operating point calculations, population assumptions, average daily flow, and peaking factor

2.08 GENERATOR SET

A. GENERAL

1. The pump station shall include an on-site backup power generator. The generator and lift station combination must include switching and control gear such that the backup power source is activated automatically without human action. The fuel source shall be natural gas. In the event that natural gas is unavailable, propane, or diesel shall be used with a minimum fuel tank/storage sized to run all pumps at full load for 48 hours. The generator must be capable of operating the lift station at full capacity, i.e., with the largest pumps, impellers, and motors, and the greatest number of pumps, that the lift station can physically contain, with all of the above operating at full speed simultaneously.

B. EQUIPMENT

1. The generator set shall be minimally rated at the kW rating as indicated on the drawings when operating at 277/480 volts, 0.8 lagging power factor. The generator set shall be capable of this rating while operating in an ambient temperature condition of 122°F (50°C).

2. The generator set shall be capable of starting motor loads as indicated on the drawings along with a minimum station load of 5 kW and a maximum voltage dip of 25%.

3. The engine shall deliver power at a governed speed of 1800 rpm.

4. Sound Attenuated Weather Protective Enclosure

   a. Manufacturer shall have a minimum five years experience in the design and construction of weather-protected generator-set enclosures.

   b. The enclosure panels shall be assembled with modular, bolt-together construction.

   c. Enclosure shall include the following features:

      1) Foam insulation on all interior surfaces
      2) Sound level not to exceed 68 dba within 7 meters of enclosure surface in any direction
      3) All exterior and interior surfaces finished with baked-on powder-coat
      4) Bottom flange with multiple mounting holes
      5) Stainless steel door hardware and lift-off hinges
      6) Lockable doors
      7) Gasketed access doors

5. Automatic Transfer Switch (ATS)

   a. It is the intent of this specification to secure automatic transfer switches that have been prototype tested, factory built, production tested, and site tested, together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein. Automatic transfer switches with number of poles, voltage and current ratings as shown on the plans shall be provided. Each ATS shall consist of an inherently double-throw power transfer switch unit and a control module interconnected to provide complete automatic operation. All equipment shall be new and of current production by an international firm which manufactures the generator, controls, and transfer switch. The company selected will assemble the standby generator set and system as a matched unit so that there is one-source responsibility for warranty, parts and service through a local representative with factory-trained personnel.

b. ATS shall be sized as indicated on the drawings, 480 volt, 3 phase, 4 wire, 3 pole with solid neutral.
c. ATS shall have dry contacts necessary to send status to SCADA (i.e., transfer switch on utility and transfer switch on generator).

6. Submit motor starting calculations and generator sizing calculations for approval.

7. The generator set shall provide the following status signals to the SCADA package:

a. Generator status
b. Generator general alarm

8. Generac.

PART 3 – EXECUTION

3.01 SYSTEM OPERATION

A. On wet well level rise, the lead pump shall start at the lead pump ON elevation. With the lead pump operating, the wet well level shall lower to all pumps OFF and turn off the pump.

B. If the wet well level continues to rise when lead pump is operating, the override switch shall energize and start the lag pump. Both lead and lag pumps shall operate together until low level switch turns off both pumps. If level continues to rise when both pumps are operating, alarm level switch shall energize and signal the alarm.

C. If one pump should fail for any reason, the second pump shall operate on the override switch.

D. If the pumps fail to turn off for any reason after receiving the signal for all pumps OFF, a low level alarm shall signal.

E. All level controls shall be adjustable for level setting from the surface.

3.02 SYSTEM TESTING AND ACCEPTANCE

A. The City will provide the contractor and owner with a Lift Station Startup Checklist, updated periodically, explaining expectations for lift station testing and demonstrations onsite prior to the system receiving live sewerage and transferring operational ownership to the City.

END OF SECTION 3500

SECTION 3600 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers cast-in-place concrete materials, reinforcing steel, forms, and finishing in conjunction with water and sewer construction.

B. Use specification defined “Class 1” 4,000-psi concrete for miscellaneous non-structural bedding, thrust blocking, anchor collars, and cast-in-place manholes.

D. Structural concrete for building and environmental structures shall comply with the applicable requirements of ACI 318 and ACI 350 latest editions. Concrete for structures is not a Standard Specification and shall require submittal, review and approval for specific case by case basis and in accordance with Sections 1000 General Conditions.

1.02 QUALITY ASSURANCE

A. If requested by the City, or the Engineer of Record, the concrete shall be tested as required in Table 11-1 , City of Fayetteville Arkansas Minimum Street Standards, as follows.

1.03 SUBMITTALS

A. Submit mix design, equipment details, and vendor name for field batched concrete.

Table 11-1 Materials Testing

	AASHTO	ASTM	Frequency
Subgrade			
Sampling	R58	D420	Per soil type encountered
Soil Classification	M145	D3282/D2488/D2487	
Standard Proctor	T99/T310	D698	
Modified Proctor	T180/T310	D1557	
Density & Moisture Content	T191/T233/T310	D6938	1 per 300 LF lane (minimum 1 per lane)
Aggregate Base Course			
Gradation	T27	C136	1 per source
Standard Proctor	T99	D698	
Modified Proctor	T180	D1557	
Density & Moisture Content	T310	D6938	1 per 300 LF lane (minimum 1 per lane)
Asphalt Concrete Hot Mix			
Sampling	T168	D979	-
Density (Nuclear)	-	D2950	As directed by City
Density (Coring)	T166	D2726	1 per 500 LF paved (minimum 2 total)
Portland Cement Concrete			
Sampling	T141	C172	1 per 100 CY 1 per 1000 LF (curb) (minimum 1 per day)
Mold and Cure	T23	C31	
Cylinder Transport	T23	C31	
Slump	T119	C143	
Air Content	T152	C231	See **Table 11-2** for Mix Design
Compressive Strength	T22	C39	
Compressive Strength (Coring)	T24	C42	As directed by City

Table 11-2 Concrete Mix Design

Concrete Properties	Class 1
28-Day Compressive Strength (psi)	4000
Portland Cement (bags)	6.0
Max. Water/Cement Ratio	0.45
Slump Range (inches)	1-4
Air Entrainment (%)	4-7
Maximum Fly Ash Content (%)	20

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete: composed of Portland cement; fine and coarse aggregate; water; and, an air entraining agent. Provide either Class 1 concrete as described below.

B. For Class 1 concrete use ready-mixed concrete; conform to ASTM C 94, latest edition; deliver and place within one hour after all materials have been placed in the mixing drum.

C. The concrete mix shall be designed so that the proportions will produce results that will meet the requirements of Class 1 concrete. Proportion components, except water, by weight. Water may be measured by volume. One sack of Portland Cement consists of one cubic foot or 94 pounds. Proportion components to meet these requirements:

1. Class 1 Concrete:

   a. Maximum net water/cement ratio = 0.45
   b. Portland cement (bags) 6.0 minimum
   c. Slump range: 1 - 4 inches
   d. Minimum 28 day compressive strength: 4,000 PSI
   e. Air Content: 4 - 7

D. Before beginning any concrete work, the Contractor shall have the concrete mix designed and the ingredients selected and proportioned by an approved independent testing laboratory meeting the requirements of ASTM E 329. Certified copies of all laboratory trial mix reports shall be sent to the Engineer from the testing laboratory for review. Do not place concrete prior to the Engineer's review and acceptance in writing of the concrete mix design.

E. Cement: Portland Cement conforming to AASHTO M 85, Type I. Use Type III cement (high early strength) only if approved by the Engineer.

F. Fly ash: Fly ash may be used as a partial cement replacement not exceeding 20% by weight of the cement when approved by the City. When fly ash is used, the total weight of both cement and fly ash will be used in design calculations.

G. Water: potable water free from injurious amounts of acids, alkalis, oils, sewage, vegetable matter and dirt.

H. Air entraining agent: use in all Class 1 concrete as required; conform to AASHTO M 154; add to the mixing water in solution; proportion to provide four (4) to seven (7) percent air in the concrete.

I. Fine aggregate: clean, hard, durable particles of natural sand free from injurious amounts of organic impurities; conform to the graduation requirements of AASHTO T 27.

J. Coarse aggregate: clean, hard and durable crushed stone or washed gravel; reasonably well graded from course to fine; per AASHTO T 27.

2.02 REINFORCING STEEL

A. Steel bars: deformed, conforming to ASTM A 615 or A 617.

B. Steel wire: conform to ASTM A 82, Cold-Drawn Steel Wire for Concrete Reinforcement.

C. Wire mesh: conform to ASTM A 185; gauge and mesh per plans.

D. Submit reinforcing steel bars shop drawings for approval.

E. All steel reinforcement: free from rust, scale, mortar, dirt, or other objectionable coatings.

PART 3 – EXECUTION

3.01 GENERAL

A. Perform excavation per Section 2300 - Excavation, Backfilling, and Compacting.

B. Build forms neat, square, and flat so concrete will have smooth finish when forms are pulled. Construct forms to provide finished concrete to dimensions shown on plans.

C. Place reinforcing steel accurately in accordance with details shown on the plans and properly secure in position.

D. Concrete shall not be placed when the temperature is below 40° F and dropping or below 35° F if the temperature is rising, unless approved by the Engineer.

E. Vibrate all structural concrete as it is placed using internal vibrators capable of transmitting vibration to the concrete at frequencies not less than 4,500 impulses per minute. Do not use form vibrators. Limit vibration to provide satisfactory consolidation without causing segregation. Do not insert vibrator more than six (6) inches into the lower courses previously vibrated. Use vibrators in a substantially vertical position; insert at uniformly spaced points no farther apart than the visible effectiveness of the vibrator.

F. Allow concrete to cure for at least 48 hours before stripping forms. If concrete is in a structural member, do not remove forms until the concrete can withstand safely all superimposed loads.

G. On all exposed surfaces, remove all fins and projections so the surface is smooth. Cut out and fill with grout any honeycombed areas. Extensive honeycombing is not allowable.

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END OF SECTION 3600

SECTION 4000 WATER PIPE, FITTINGS AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers pipe, pipe joints, fire hydrants, fittings, and other materials for water lines and service lines.

B. Use only materials approved by the City of Fayetteville.

C. The Standard Specifications include pipe and fitting in diameters up to and including 18-inch diameter. Pipe and fittings for nominal pipe diameters/sizes greater than 18-inch are not a Standard Specification. Projects including pipe and fittings for nominal pipe sizes greater than 18-inch will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

D. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification. Work for, on or connecting to the City's PCCP will be considered on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 SUBMITTALS

A. The Engineer of Record shall approve all materials.

B. Submittals will further include the manufacturer's certificate that the materials meet with these Specification requirements including material testing requirements.

1.03 LEAD-FREE BRASS

A. All brass shall be manufactured in accordance with the Safe Drinking Water Act (SWDA latest edition and as amended) to be LEAD-FREE brass.

1.04 LEAD-FREE PIPES, FITTINGS, FIXTURES, SOLDER and FLUX

A. Comply with the Safe Drinking Water Act (SWDA) latest edition and as amended.

PART 2 – PRODUCTS

2.01 GENERAL

A. DOMESTIC UNITED STATES OF AMERICA (USA) MANUFACTURE

Comply with SECTION 1000 GENERAL REQUIREMENTS 1.05.A DOMESTIC USA MANUFACTURE.

B. MINIMUM WORKING PRESSURE

Unless approved otherwise in writing by both the Utilities Director and the designated City ‘s engineer, all pipe, fittings, materials, and appurtenances used in potable water line installation and repair will be rated for a minimum working pressure of 250 psi. Additional, higher than 250 psi requirements, apply to individual items as specified.

2.02 POLYVINYL CHLORIDE (PVC) PIPE FOR WATER LINES

A. PVC pipe for water lines shall be blue in color.

B. PVC pipe less than 4 inches is not permitted for water mains/lines per the Standard Specifications.

PVC pipe for water service extensions less than 4 inches diameter will be considered only on specific case by case basis in accordance with Section 1000 General Requirements and Section 2001 Design Standards – Water. PVC pipe for water service extensions less than 4 inch diameter, if approved, shall be ASTM D-2241 SDR 13.5 and further meeting all requirements of these Standards.

C PVC pipe 4 inches through 12 inches in size shall be manufactured in accordance with AWWA C900, latest revision, and shall be DR 14. Ten (10) inch diameter water main/pipe is not permitted.

D. PVC pipe, couplings, and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454 as defined in ASTM D1784, latest revision. Clean, reworked material generated from the manufacturer's own production shall be acceptable as long as the pipe produced meets all the requirements of the Specifications.

E. Joints for PVC pipe shall conform to ASTM Specification D-3139, latest revision.

F. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

G. Marking on pipe shall include the following and shall be applied at intervals of not more than 5 feet.

1. Nominal size in inches and OD base (for example, 8 DI).
2. PVC.
3. Dimension ratio (for example, DR 14).
4. AWWA pressure class (for example, PC 305).

5. Test pressure for hydrotested pipe (for example, T330) or if not tested, “NOT HYDROSTATIC PROOF TESTED.”
6. AWWA designation number for this standard (ANSI/AWWA C900, or ASTM D-2241).
7. Manufacturer’s name or trademark and production run record or lot code.
8. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable-water service.

2.03 DUCTILE IRON PIPE FOR WATER LINES

A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.

B. Ductile iron pipe shall be designed in accordance with the requirements of "Thickness Design of Ductile-Iron Pipe", ANSI/AWWA C150/A21.50, latest revision. Minimum pressure class shall be 250 psi.

C. Joint connections, pipe and fittings (latest revision):

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.

E. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer’s mark, country where cast, year in which the pipe was produced, and the letters “DI” or “DUCTILE” shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 in. (356 mm) and larger shall be not less than 1/ 2 in. (13 mm) in height.

F. Interior Lining Required

The interior lining for use under normal conditions shall be a cement–mortar lining without seal coat in accordance with the latest revision of ANSI/AWWA C104/A21.4, latest revision and NSF 61.

G. Exterior Corrosion Control

Outside coating shall be manufacturer’s standard 1 mil thickness asphaltic exterior coating per ANSI/AWWA C151/A21.51. Per the Ductile Iron Pipe Research Association (DIPRA) the 1 mil asphaltic coating is not a corrosion control method but furnished by the manufacturers to minimize atmospheric oxidation for aesthetic reasons.

Ductile Iron Pipe and fittings shall be double wrapped in polyethylene tube or sheet materials conforming to the requirements of ANSI/AWWA C105/A21.5.

Additional corrosion control methods, including but not limited to cathodic protection and/or zinc coating, may be required for specific sites and projects as requested by the City or designed by the Engineer and in accordance with DIPRA publication "The Design Decision Model for Corrosion Control of Ductile Iron Pipe" latest edition.

H. All ductile iron pipe shall be Made in USA.

2.04 POLYETHYLENE (PE) PRESSURE PIPE AND TUBING

A. Polyethylene (PE) pressure pipe is not permitted as publically (City) maintained water main or water service lines.

2.05 COATED COPPER PIPE/SERVICE TUBING

A. Coated Copper Pipe 1" – 2":

Coated copper pipe shall be Type "K", soft tempered, seamless, annealed, copper pipe suitable for use for underground water service installation, in accordance with ASTM B88, and with an approved polyethylene coating system (minimum 25 mil). Coated copper pipe shall meet or exceed NSF-61 requirements.

Damage to the polyethylene coating for the coated copper pipe must be repaired with Polyken Tape Coating or Denso paste and tape, or as recommended by the coated copper pipe manufacturer's engineer.

B. Connections to ductile iron pipe (DIP) main lines including fittings for coated copper pipe to DIP main lines shall be double poly wrapped (polyethylene encasement) a minimum of three feet beyond the DIP main pipe onto the coated copper service line.

C. Copper shall be joined using ProPress fittings by Viega and feature green dot Smart Connect markings.

D. Coated copper pipe under roadways shall be encased in SDR9 polyethylene, ASTM D-2241 SDR13.5 pipe sleeve, or C900 PVC.

E. Polyethylene pressure pipe and tubing (PE or HDPE or variations) shall not be used for publically maintained water service materials.

2.06 POLYETHYLENE ENCASEMENT (PIPE WRAP)

A. Polyethylene encasement shall be in conformance to ANSI/AWWA C105/A21.5, latest revision. The virgin linear low-density polyethylene film shall have a minimum normal thickness of .008 inches (8 mils), and shall be provided in either flat tube or sheet form.

B. The color shall be black with nominal 2% carbon black UV inhibitor and printed per the AWWA C105 standard.

C. Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900 or Scotchrap #50, at least 2-inches wide, and installed as per the Polyethylene Encasement Installation Guide published by DIPRA. Duct Tape is not permitted.

D. All buried iron pipe, valves, and fittings shall be double wrapped.

2.07 DUCTILE IRON FITTINGS

A. All ductile iron fittings shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings. All fittings shall be MJ x MJ. All fittings shall be fusion-bonded epoxy coated inside and outside in accordance with ANSI/AWWA C116/A21.16.

B. All ductile iron fittings shall be Made in USA.

2.08 FOSTER ADAPTERS

A. Compact MJ restraints shall be Foster Adapter by Infact Corporation. Made in USA.

2.09 SWIVEL ADAPTERS AND HYDRANT TEES

A. Swivel adapters and hydrant tees shall be designed for a working pressure of at least 250-psi and to fit standard mechanical joint fittings (AWWA C111). One end of the swivel adapter and the branch of the hydrant tee shall be provided with a gland that may be rotated 360 degrees on the fitting. Lengths of swivel adapters shall be as specified.

2.10 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes 3-inch through 24-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

B. Mechanical joint retainer glands shall be made from ductile iron and shall be designed for a working pressure of at least 350-psi for 3-inch through 16-inch ductile iron pipe, at least 305-psi for 3-inch through 8-inch PVC, and at least 250-psi for 12- 24 inch ductile iron pipe.

C. Retainer glands shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability. Retainer glands shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).

1. Retainer glands for pipe sizes 3-inch through 12-inch shall be manufactured by EBAA Iron, Inc. (USA only), Smith-Blair, Inc. (USA only), or Star Pipe Products (USA only).
2. Retainer glands for pipe sizes greater than 12-inches shall be manufactured by EBAA Iron, Inc.(USA only), or Star Pipe Products (USA only).

2.11 PIPE RESTRAINTS

A. Bell restraints for AWWA C900 PVC sizes 4-inch through 8-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc. (USA Only). Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

B. Bell restraints for Ductile Iron Pipe sizes 4-inch through 24-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc. (USA Only). Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.

C. When all-thread attachments are required, eye-bolt style attachments are not permitted. Romac “Ductile Lug” style attachments shall be used. All-threads shall be made of 316 stainless steel.

2.12 RESTRAINED FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters used to transition from plain end pipe to a flanged fitting, above ground, shall be EBAA Iron Series 2100 or Romac. Made in USA.

B. Pressure rating shall be a minimum of 250 psi and be fusion bonded epoxy coated.

2.13 RESTRAINED COUPLINGS

A. Restrained couplings to connect two pieces of pipe, size on size, shall be Made in USA, EBAA Iron Series 3800 Restrained Coupling or Romac 400RG.

B. Restrained coupling pressure rating shall be a minimum of 250 psi and be fusion bonded epoxy coated.

2.14 BOLTS AND NUTS

A. All bolts and nuts for valves, fittings, and restraints shall be 316 stainless steel unless specified otherwise. Anti-seize lubricant shall be used when assembling all stainless steel hardware to reduce galling.

2.15 GATE VALVES

A. Gate valves 4-inch through 8-inch nominal pipe size shall be resilient-seated type, non-rising stem gate valves, in conformance with the requirements of AWWA C509 or AWWA C515, latest revision. Ten (10) inch pipe and gate valves are not permitted for water main/pipe.

B. Gate valves shall be Made in USA and shall be Mueller Series 2360, American Flow Control Series 2500, American AVK Company Series 25 or Series 45, or Clow 2638

C. All gate valves shall be designed for a minimum of 250 psi working pressure. All gate valves shall have 304 stainless steel bolts.

D. All gate valves shall have O-ring stem seals. The O-ring stem seal shall be so designed that the seal above the stem collar can be replaced with the valve under pressure in the full-open position.

E. Gate valves shall have standard mechanical joint ends unless otherwise indicated on the approved Drawings.

F. Buried gate valves shall be designed for operation with a nominal 2-inch square operating nut. The standard direction of opening shall be open left as viewed from the top.

G. Handwheels for gate valves shall be in conformance to AWWA C515, latest revision.

H. The interior and exterior of the valve body and bonnet shall have factory applied fusion bonded epoxy coating meeting AWWA C550, latest revision.

I. Valves shall be tested in accordance with AWWA C515, latest revision.

J. Markings shall be cast on the bonnet or body, or stamped on a permanently affixed corrosion-resistant tag of each valve.

1. Manufacturer's name or mark.
2. Year the valve casting was made.
3. Size of the valve.
4. Letters C509 or C515
5. Working water pressure (e.g. 250W)

2.16 BUTTERFLY VALVES

A. Butterfly valves are required for pipe 12-inch and larger. Butterfly valves shall be Made in USA. Butterfly valves shall conform to the requirements of AWWA C504, latest revision, for Rubber-Seated Butterfly Valves.

B. Butterfly valves shall be Pratt HP250II or Dezurik BAW.

C. Butterfly valves shall be designed for a minimum of 250 psi working pressure. Butterfly valves shall have 304 stainless steel bolts.

D. Butterfly valves shall be of the tight closing, synthetic rubber-seat type, as follows.

1. Valves 20 inches (nominal diameter) and smaller shall have bonded seats which are simultaneously molded in, vulcanized and bonded to the body. Seat bond must withstand 75 pounds pull under test procedure ASTM D429, Method B.

2. On valves 24 inches and larger, all seats shall be of a synthetic rubber compound. Seats shall be retained in the valve body by mechanical means without retaining rings, segments, screws or hardware of any kind in the flow stream. Seats shall be a full 360° without interruption and have a plurality of grooves mating with a spherical disc edge seating surface. Valve seats shall be field adjustable around the full 360° circumference and replaceable without dismantling operator, disc or shaft and without removing the valve from the line.

E. Valve discs shall utilize an on-center shaft and symmetrical design and be cast from Ductile Iron ASTM A536 Gr. 65-45-12. The disc edge shall be stainless steel type 316.

F. Butterfly valves shall have standard mechanical joint ends unless otherwise indicated on the Drawings.

G. Buried butterfly valves shall be designed for operation with a nominal 2-inch square operating nut. The standard direction of opening shall be open left as viewed from the top. The valve shaft shall be constructed of stainless steel and the bearings shall be corrosion resistant and self-lubricating. The valves shall be equipped with a totally enclosed type operator, fully gasketed and grease packed, suitable for direct burial.

H. The interior and exterior of the valve body and bonnet shall have factory applied epoxy coating system meeting AWWA C550, latest revision.

I. Valves shall be tested in accordance with AWWA C504, latest revision.

J. Markings shall be cast on the bonnet or body, or stamped on a permanently affixed corrosion-resistant tag of each valve.

1. Manufacturer’s name or mark.

2. Year the valve casting was made.
3. Size of the valve.
4. Class (e.g. 250B)

K. Materials for 12 inch water mains will be PVC , except that ductile iron pipe may be required on each side of certain fittings and appurtenances including, but not limited to, 12-inch Butterfly Valves (BFV). This detail shall be provided by the Engineer of Record.

2.17 BALL VALVES

A. Ball valves shall be made in USA, and shall be Ford B11-777-NL or James Jones E1900, with "tee-head" style operating nut.

2.18 VALVE BOXES

A. Valve boxes shall be Made in USA, and shall be East Jordan Iron Works 8550 Series or Tyler Union 6850 Series, screw type, and shall be of correct length to match the bury of the main.

B. The valve box and appurtenances shall include a base and a top section with a drop lid. The lid shall be marked with the word "WATER". All lids shall have a concrete pad with a minimum of 18 inches square or round dimension as appropriate.

C. Lids on valves on fire lines shall be marked with the word "FIRE" and painted red.

D. Lids on 2" valves shall be marked with the words "2" VALVE".

E. Markings shall be cast on each part:

1. Manufacturer's name or mark.
2. Model number
3. Year the casting was made.
4. Material of construction
5. USA

F. A valve box alignment device shall be provided and installed for each valve box installation. The device shall be of HDPE or Glass Filled Polypropylene construction. It shall be furnished in two pieces that will lock together under the operating nut of the valve without requiring the removal of the operating nut. The device shall not affect the operation of the valve. The device shall be AFC Alignment Ring as manufactured by American Flow Control.

2.19 OPERATING NUT EXTENSIONS

A. Operating nut extensions shall be used when the top of the operating nut is greater than 4 feet from the top of finished surface.

B. The stem shall be 1" SCH40 steel pipe with a 2-inch square bar steel operating nut attached to the upper end. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 24-inches to 12-inches of the finished surface. A box wrench, 2 1/8" I.D. square, made from steel 3/16-inches thick shall be welded to the lower end of the stem extension which will fit over the valve operating nut. Two-inch valves with a tee-head operating nut will require a rectangular shaped box wrench on the end of the valve stem extension. The extension shall be secured to the valve operating nut by two 3/8" set screws. A round center guide made from 1/8-inch or 3/16-inch steel plate shall be placed on the valve stem extension approximately 6-inches from the upper end. The diameter of the guide shall be slightly less than the inside diameter of the valve box. The guide shall be affixed to the stem extension in such a way that it can rotate freely on the stem. Welds on stem extensions (top and bottom nut) shall be 1/8" - 3/16" fillet weld around full circumference.

C. Shop drawings shall be submitted to the City of Fayetteville for approval prior to installing the stem extension pieces.

2.20 FIRE HYDRANTS

A. Fire hydrants shall be dry barrel hydrants in conformance with AWWA C502, latest revision. Fire hydrants shall be designed for a working pressure of 250 pounds per square inch gauge. Fire hydrants shall be three-way, and painted white with reflective glass beads above the ground line. Coating system shall be compatible with Sherwin Williams SHER-CRYL™ HPA – High Performance Acrylic B66-300 Series that is used to color code the fire hydrants. Permitted fire hydrants are (only) American Flow Control 5-1/4" Waterous Pacer WB67-250, Mueller Super Centurion 250 hydrants, and CLOW Medallion Dry-Barrel. No approved equals. Made in USA only.

B. Hydrants shall have a 6 inch mechanical joint inlet in conformance to the dimensions shown in ANSI/AWWA C110/A21.10, latest revision. Three-way hydrants shall have a 5-1/4 inch valve opening.

C. Fire hydrants shall be equipped with a two-piece barrel with a safety stem coupling and a break-a-way flange at the ground line and shall be designed for a 48-inch bury.

D. Hydrants shall be equipped with two 2-1/2 inch hose nozzles and one 5-1/4 inch pumper nozzle. The operating nut shall be a nominal 1-1/2 inch pentagon, National Standard operating nut designed to open left (counterclockwise).

E. Hydrants shall be supplied WITHOUT nozzle cap chains.

F. Fire hydrants in non-paved areas shall be installed with a 24" x 24" square, 12" thick concrete pad, reinforced with 2 layers of #5 rebar, around the lower barrel of the hydrant six inches below the bottom of the break-away flange.

G. A fire hydrant extension shall be installed in all locations where the centerline of the pumper nozzle is less than 18-inches above the finished grade elevation. The extension shall bring the centerline of the pumper nozzle between 18-inches and 24-inches above the finished grade elevation. The centerline of the pumper nozzle shall be 24-inches above rough grade elevations where sidewalks and yards will be installed in the future, in new subdivisions only. Extensions shall be Waterous K562, Clow 2500, or Mueller A-320, with no more than one extension allowed per hydrant.

H. Identification tags shall be installed indicating the depth of bury of all hydrants. Additional tags shall be installed indicating the length of any extension installed.

2.21 BLOW-OFFS

A. Blow-offs shall have a 2-1/2" hose nozzle, traffic break-away, locking cover and be designed for 48-inch bury. Blow-offs shall be Mainguard #77 as manufactured by The Kupferle Foundry Company.

2.22 AIR RELIEF VALVES

A. All water mains shall have 1"-2" single bodied air and or combination air and vacuum valves or 3"-10" dual bodied combination air and vacuum valve where indicated on the drawings. Valves shall have fiberglass reinforced nylon body or epoxy coated and lined cast iron bodies with stainless steel or non-metallic internal parts. Valve shall have rolling seal mechanism to allow full or partial opening and sealing of orifice or metal to metal stainless steel seating. The 1" – 2" valves float shall be made of foamed polypropylene and shall disrupt vortex and allow float to remain open until a 11 psi differential is achieved. Valves shall have a 250 psi working pressure. Valves shall be listed under NSF-61 and shall have ISO 9001 certificate. Valves shall be supplied with a male thread outlet or flanged outlet. All nipples and isolation valves for 1"-2" valves shall be brass or stainless steel. Ball style isolation valve shall be full port. Isolation valves for 3"-10" shall conform to Paragraph 2.12 – Gate Valves.

B. Air release valves shall be A.R.I. Model D-040 for 1" and 2" or A.R.I. Model D-060-C HF NS for 3" – 10".

2.23 SERVICE SADDLES

A. Service saddles for 1" and 2" NPT service taps shall be sized for use on C900 PVC. Service saddles shall be Romac 101NS.

2.24 TAPPING SLEEVES

A. Tapping sleeves shall be designed for a minimum 250 psi working pressure and the material being tapped. All bolts and nuts shall be stainless steel.

1. Tapping sleeves for 4-inch through 24-inch shall be stainless steel and shall be 100% domestic made in the USA. Tapping sleeves shall have an MJ outlet.

2. Tapping sleeves shall be Ford FAST, Romac, JCM 439, or Smith Blaire. Made in USA.
3. Tapping sleeves larger than 24-inch are not a standard specification and will require independent review and approval by the Utilities Engineer.

2.25 SERVICE CONNECTION MATERIALS, FITTINGS AND BRASS

A. All service connection materials, fittings and brass shall be 100% domestic USA. All service connection materials, fittings and brass shall be manufactured in accordance with the Safe Drinking Water Act (SWDA latest edition and as amended) to be LEAD-FREE brass (aka No-Lead).

If a specific item is listed in the following table(s) insert the designation required for 100% domestic USA and Lead-Free (or No-Lead). All service connection materials, fittings and brass shall be designed for a minimum working pressure of 250 psi.

B. All service connection materials, fittings and brass shall be manufactured by Ford Meter Box Company, Inc. or Mueller Company and as further specified below. Equivalent cross referencing for corporation stops and meter setters shall be permitted if approved in writing by the City of Fayetteville's designated City engineer.

C. Materials proposed for all service connection materials, fittings and brass shall be submitted to the designated City engineer for review after the Engineer of Record's review and recommended approval.

D. Materials for standard meter sets 5/8", 1", 1-1/2", and 2" are indicated in the following tables. Materials and standards for larger meters (3" and greater) are not listed in the standard specifications. Larger meter installations require a site specific design. Please contact the City of Fayetteville Meter Department for information concerning meter size 3" or greater. Please contact the City of Fayetteville Engineering Department for standard drawings that may be incorporated for meter size 3" or greater.

E. Design for 1-1/2" and 2" meter locations require project specific design of the piping from the main to the meter to avoid stress of the 2" coated copper pipe and to avoid excessive fittings. Alternate ductile iron piping and fittings (4 inch and greater) may be required for elevation changes between the water main and the 2" coated copper. All water service piping for meters settings greater than 1" shall be further designed by the Engineer of Record and submitted to the designated City engineer for review.

F. Meter arrays for multiple meters fed from a single 2-inch tap shall be made per the standard details. These must be approved on a case-by-case basis, and may be required by the City to reduce the number of taps on a public main.

Single Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
5/8" x 3/4" x 12" meter yolk	Ford VB72-12W-44-43-SQ-NL
	Mueller 238B2567-R--93N
1/2" x 16" SCH 40 PVC brace	
3/4" coated copper tail piece 4' long	
18" diameter x 24" deep SDR51 PVC meter box	
18" Composite Meter Lid	DFW Model: DFW1820CP-AF1EF2 SMALL FAY-LID

Double Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
1" x 7.5" x 3/4" U branch	Ford U48-43-7.5-Q-NL
	Ford multipurpose end C31-23-NL (x2)
	Mueller H15363N (1" compression inlet)
	Mueller end connection H14222N (x2)
5/8" x 3/4" x 12" meter yolk x 2	Ford VB72-12W-14-33-Q-NL
	Mueller 238B2567-RN
1/2" x 16" SCH"40 PVC brace	
3/4" coated copper tail piece 4' long	
18" diameter x 24" deep SDR51 PVC meter box	
18" Composite Meter Lid	DFW Model: DFW1820CP-AF1EF2 SMALL FAY-LID

1-inch Meter Set

main diameter x 1" saddle	Romac 101NS
1" corporation stop	Ford FB1000-4-Q-NL
	Mueller B25008N
1" coated copper – City side	
1" x 12" meter yolk	Ford VB74-12W-44-44-Q-NL
	Mueller B24701RN
3/4" x 16" SCH40 PVC brace	
1" coated copper tail piece 4' long	
24" diameter x 24" deep SDR51 PVC meter box	
24" cast iron flat meter lid	East Jordan 111, w/ Fayetteville logo (35108004)

1-1/2 inch and 2-inch Meter Set

main diameter x 2" saddle	Romac 101NS
2" brass close nipple	
2" ball valve	Ford B11-777-NL
2" MIP x quick joint	Ford C84-77-Q-NL
	Mueller H15428N
2” coated copper – City side	
2" MIP x quick joint	Ford C84-77-Q-NL
	Mueller H15428N
2" meter setter	Ford Custom setter Item VBB77-95082-110-NL
1" x 24" SCH40 PVC brace (x2)	
2" coated copper tail piece 2’ long	
36" diameter x 36" deep composite meter box w/ top ring	East Jordan 8428 Assembly (38003636A01)
28" outer cover, w/ lock	East Jordan 8428E, w/ Fayetteville lettering (00842845A01)
11" inner cover, w/o lock	East Jordan D Meter Cover (32193001)

2.26 TRACER WIRE

A. Tracer wire shall be 12-gauge solid coated copper or coated copper clad steel for underground burial.

B. Jacket color shall be BLUE, and made of High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE) designed for direct burial.

C. Connectors shall be used for all splices or repairs. Connectors shall be moisture displacement style as manufactured by 3M DBR. Wire shall be twisted and bent, without the use of a wire nut prior to insertion into the gel cap.

D. A locate or conductivity test shall be performed prior to signing off on the project.

2.27 MARKING TAPE

A. Non-metallic water marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Harris Industries, Inc.

B. Tape shall have a minimum thickness of 4 mils and manufactured with heavy metal-free polyethylene tape that is impervious to all known alkalis, acids, chemical reagents, and solvents found in soil. The minimum overall width of the tape shall not be less than 3-inches. Standard rolls shall be 1000' length.

C. The tape shall be color coded Safety Blue and imprinted with the following message:
Caution – Buried Water Line Below

2.28 WATER LINE MARKERS

A. Water line markers shall be TriView Marking System by Rhino Marking and Protection Systems, Carsonite International Dual-Sided Utility Marker (CIB-380). All markers shall be installed according to the manufacturer's recommendations. The uppermost portion of the Carsonite marker shall be made of Visibility Enhancer (CVE-360)and must be bolted to the utility marker. TriView markers do not require visibility enhancers. The utility marker shall read as follows: "CAUTION, WATER PIPELINE", "City of Fayetteville", and "Before Digging Call 1-800-482-8998". The label shall also include the official City Logo and be white in color with blue and black lettering. The label shall be affixed to two sides of the marker. An additional white 1" wide reflective tape (3M) shall be placed around the full circumference of the top of the marker. Concrete shall be placed 6-inches around and 1-foot deep around the base of each marker.

B. Markers in rural areas shall be placed adjacent to valves and hydrants and spaced along the length of the water line a maximum of 500 feet.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation Section 2400
B. Water Lines: Refer to Section 4100
C. Water Service Lines: Refer to Section 4100

END OF SECTION 4000

SECTION 4100 INSTALLATION OF WATER PIPE, FITTINGS, AND MATERIALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Installation of water lines.

B. Installation of water service lines.

1.02 WORK EXCLUDED

A. Any and all work for, on or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) is not permitted as a Standard Specification.

B. Any and all work for, on, or connecting to the City's concrete pressure water pipe (Prestressed Concrete Cylinder Pipe, PCCP) will be considered only on specific case by case basis in accordance with Section 1000 General Requirements. Approval will be project specific and requires approval from the Utilities Director.

PART 2 – ADDITIONAL REQUIREMENTS

2.01 ADDITONAL REQUIREMENTS

A. PIERS

1. Water pipe on piers shall be Ductile Iron Pipe. The ductile iron pipe shall meet the requirements of Section 4000 – Water Pipe, Fittings, and Materials, of these Specifications.

2. Piers shall be designed by the Engineer of Record for the specific project and submitted per Section 1000 General Requirements.

3. Install concrete piers as indicated on the approved plans and per Section 3600 - Cast-In-Place Concrete.

B. COLD WEATHER INSTALLATION

1. The City reserves the right to order pipe installation discontinued whenever, in its opinion, there is danger of the quality of work being impaired because of cold weather. Do not lay any pipe on frozen ground. No water pipe shall be installed when the air temperature is less than 32º F unless proper precautions per the manufacturer's recommendations are taken by the Contractor and the method is approved by the Engineer and City.

2. When pipes with rubber gaskets or resilient-type joints are to be laid in cold weather, sufficiently warm the gasket or joint material per manufacturer's recommended methods to facilitate making a proper joint.

C. SOLID SLEEVE INSTALLATION

1. Solid sleeves shall be installed the same as mechanical joint connections for pipe installation.

2. The maximum gap between the two pipes being connected by a solid sleeve shall be one-half (1/2) inch.

PART 3 – EXECUTION

3.01 VALVE INSTALLATION

A. Valves shall be jointed in accordance with the methods of jointing pipe as specified elsewhere herein. Valve stems shall be plumb and there shall not be any obstructions that will prohibit the installation of valve boxes directly over the stem. Mechanical joint retainer glands shall be installed on all valves with mechanical joint ends.

B. All valves shall be firmly supported from below with compacted crushed stone up to and including 8-inch valves, or concrete for all valves greater than 8-inches.

C. All valves shall be double poly wrapped

D. Valve boxes shall be installed over the operating nut of each valve and be of adequate length to reach the finished ground or paved surface. Valve boxes shall be installed with a HDPE Valve Box Alignment Device of the proper size and manufacture to fit the valve and the valve box. Boxes shall be firmly supported, plumb, and centered over the valve operating nut. No part of the box shall rest on the valve. The box cover shall be flush with the finished surface.

E. Operating nut extensions shall be used when the top of the operating nut is greater than 4 feet from the top of finished surface. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 24-inches to 12-inches of the finished surface.

F. Tracer wire shall be brought up on the OUTSIDE of the valve box. A hole or notch shall be made through the valves box approximately 4-inches below the top. The tracer wire shall be pushed through the hole or notch. Approximately 12-inches of wire shall be coiled inside the valves box for traceability. The tracer wire shall not interfere with the insertion of the lid onto the valve box.

G. All lids shall have a concrete pad with a minimum dimension of 18 inches square or round as appropriate. A concrete pad with a minimum dimension of 36 inches square or round as appropriate shall be installed for all valves 24-inches and larger.

3.02 FIRE HYDRANT INSTALLATION

A. Pipe used to install fire hydrants from the required auxiliary valve on the water main to the fire hydrant shall be fully restrained. An additional valve for maintenance may be required for significantly long fire hydrant leads as determined by the designated City engineer.

B. Hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and bottom section up to the main valve. The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

C. The Contractor shall take great care to protect the factory applied coating system. Means and methods for the protection of the fire hydrant are the responsibility of the Contractor. At no time shall chains or other abrasive materials come into contact with the factory applied coating system.

D. Minor touchup for “incidental” scratches is permitted using factory provided touchup kits.

E. When the factory applied coating system (from the bury line up), as identified by the City of Fayetteville, has damage other than “minor scratches,” a new upper barrel section shall be ordered and delivered from the factory, inclusive of all internal working parts up to the operating stem breakaway. The upper barrel shall be replaced, and the damaged upper barrel returned to the factory at no cost to the City of Fayetteville. This includes, but is not limited to, excessive scratches, appearance of rust, or other aesthetic flaws. Field repainting of new fire hydrant installations is not permitted.

F. Hydrants shall be located a safe distance from driveways, roadways and narrow type sidewalks and in a manner to provide complete accessibility, and they shall stand plumb with nozzles at proper elevation. The hydrant’s “bury line” shall be set at or no more than four (4) inches above the finished grade elevation; therefore the bottom of hydrant nozzles shall be 18 to 22 inches above the finished grade elevation.

G. Installation of fire hydrant extensions shall be made in the presence of the Engineer or the Engineer’s representative and shall be per the manufacturer’s instructions. The breakable flange and breakable stem coupling shall be removed and installed above ground level.

H. The Contractor shall, if necessary, rotate the hydrant barrel or nozzle section at the flanged joint to obtain the desired nozzle position as specified by the Engineer. The pumper nozzle shall be at a right angle to and face the street unless otherwise directed by the Engineer.

I. The bowl or bottom of the hydrant shall be supported firmly on the bottom and shall be braced against unexcavated earth at the end of the trench with concrete reaction backing. Solid

concrete blocks may be used to support the bottom of the hydrant. If considered necessary by the Engineer, the hydrant shall be tied to the branch pipe with suitable Series 300 STAINLESS STEEL rods or clamps. These rods or clamps shall be furnished by the Contractor without additional compensation.

J. A drainage bed shall be provided under and around the base of the hydrant of at least six (6) cubic feet in volume and extending at least six inches (6") above the drain outlet and shall consist of approved embedment aggregate material. Under no circumstances shall the drain outlet on the hydrant or the drainage bed be connected to a sewer.

K. Backfilling and tamping around hydrant barrels shall be continuous in operation.

L. Fire hydrants, immediately after installation, shall be covered and wrapped with a heavy cloth, water-resistant sack, or black polyethylene sheeting, well taped in place around the hydrant, to identify the hydrant as being "not in service".

M. All fire hydrants installed within the City of Fayetteville water operational territory shall be painted white with glass reflective beads above the ground line. Factory coating system shall be compatible with Sherwin Williams SHER-CRYL™ HPA – High Performance Acrylic B66-300 Series that is used to color code the fire hydrants. Sherwin Williams DTM ACRYLIC COATING shall be used for the Safety Orange color only, as it is not available in HPA.

N. All fire hydrant nozzle caps, bonnets and operating nuts shall be painted with two coats of paint according to the following table:

Flow Under Fire Conditions	Color	Color Specification
More than 1500 gpm	Light Blue	Robotic Blue SW4063
1000 to 1499 gpm	Green	Safety Green SW4085
500 to 999 gpm	Orange	Safety Orange SW4083
Less than 500 gpm	Red	Safety Red SW4081

O. The City of Fayetteville may provide the flow under fire conditions for each new fire hydrant installation based upon the current water modeling software or the Engineer of Record may furnish flow data based upon a current fire hydrant fire flow test performed in the area. Developer is responsible for fees associated with hydrant flow tests conducted by the City.

3.03 METER SETTINGS

A. Meter settings shall be installed where shown on the Drawings and/or as directed by the City. Installation shall be as per the City Engineering Standard Details. Meter setters shall be

installed in a horizontal and plumb position within the meter box and at a depth to provide the required space between the top of the meter and the bottom of the meter box lid.

B. A drainage bed consisting of approved embedment aggregate material shall be placed a minimum of 6-inches thick and 6-inches outside the edge of the bottom of the meter box. Non-woven filter fabric consisting of 8 oz/sy shall be placed on top of the drainage bed. The filter fabric shall extend 12-inch outside the edge of the bottom of the meter box. After the installation of the water service line, meter setter, meter box, and lid, the filter fabric shall be wrapped up the meter box and service line penetrations and taped securely to the meter box to provide a "dirt seal" before backfilling.

C. Tracer wire shall be brought up on the INSIDE of the meter box with the water service line. Sufficient tracer wire shall be provide such that approximately 12-inches of wire will extend beyond the top of the box when pulled taut. The tracer wire shall be loosely coiled and place inside the meter box. Do not wrap the tracer wire around the meter setter. An additional tracer wire shall be installed at the appropriate time from the meter to the building.

D. The bottom of the meter setter connections shall be visible at the bottom of the meter box at the time of testing and of final inspection. Any dirt or debris in the bottom of the meter box shall be removed before the project is released for final payment and/or acceptance.

E. The final grade at the meter box location shall be determined by the Engineer of Record and the meter box shall be placed at that grade. Final grade should take into account probable future installation of topsoil and/or sod. Any boxes falling in driveways or sidewalks shall be relocated at the expense of the developer or lot owner. No meters shall be set by the City until the meter box is adjusted to the proper grade.

F. Where PVC is used for 2-inch water service lines, any joint within 20-feet of the City's side of the meter vault must be mechanically restrained.

3.04 BLOW-OFF INSTALLATION

A. Blow-off hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and bottom section up to the main valve. The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

B. Blow-offs shall be so located that the distribution system may be properly flushed, and so that danger of contamination of the water line by backflow will be eliminated. No blow-off shall be connected to any sewer or storm drain, submerged in any surface water or installed in any manner that will permit backsiphonage into the distribution system. The discharge of the blow-off shall be located above natural grade, and be screened, capped or plugged.

C. Blow-off hydrants shall be installed in such a manner to provide complete accessibility, and they shall stand plumb with nozzles at proper elevation. The discharge nozzle shall be a minimum of 24-inches above finished grade elevation.

D. The bowl or bottom of the blow-off hydrant shall be supported firmly on the bottom and shall be well braced against unexcavated earth on the backside of the blow-off hydrant. Solid concrete blocks, or other suitable material may be used to block the blow-off hydrant.

E. A drainage bed shall be provided under and around the base of the blow-off hydrant of at least six (6) cubic feet in volume and extending at least six inches (6") above the drain outlet and shall consist of ASTM #67 gravel. Under no circumstances shall the drain outlet on the hydrant or the drainage bed be connected to a sewer.

F. Backfilling and tamping around blow-off hydrant barrels shall be continuous in operation.

G. Blow-off hydrants, immediately after installation, shall be covered and wrapped with a heavy cloth, water-resistant sack, or black polyethylene sheeting, well taped in place around the hydrant, to identify the hydrant as being "not in service".

3.05 TAPPING SADDLE INSTALLATION

A. Tapping saddles shall be used for 1-inch and 2-inch service taps.

B. The pipe shall be free of dirt and other debris before attaching tapping saddle. That part of the pipe barrel, other than concrete pipe, which will be in contact with the gasket of tapping saddles, shall be smooth. All rough areas on the pipe barrel shall be smoothed. The Contractor shall field verify all pipe and fitting dimensions. Tapping saddles shall be installed at least twenty-four (24) inches from bell joints, fittings, end of pipe joint, or another tap.

C. Tapping saddles shall be bolted securely to the pipe. The face of the outlet shall be zero to ten (0-10) degrees from horizontal. The bolts for tapping saddles shall be alternately tightened "snug" and then alternately tightened to a torque as recommended by the manufacturer.

D. The tapping valve shall be attached securely to the tapping saddle to provide a water tight seal. Proper tools for installing brass hardware shall be used.

E. The pilot drill and shell cutter shall be in good condition. The pilot, shell cutter, and any other component of the tapping machine that will or may come into contact with the interior of the tap valve or potable water pipe, shall be thoroughly sterilized with straight bleach or super-chlorinated solution. The shell cutter shall be the size required to cut the full opening specified and with a sufficient depth greater than the wall thickness of the pipe being tapped.

F. After the tap is complete and the tapping machine has been removed, the bolts for the tapping saddle must be re-torqued per the manufacturer's specifications to ensure a proper seal.

G. The tapping saddle shall be double poly wrapped.

H. The contractor will follow the manufacturer's requirements and follow the current version of the "Tapping Guide for PVC Pressure Pipe", UNI-PUB-8, by the Uni-Bell PVC Pipe Association. The Contractor shall provide the removed pipe coupon to the City.

3.06 TAPPING SLEEVE INSTALLATION

A. The pipe shall be free of dirt and other debris before attaching tapping sleeve. That part of the pipe barrel that will be in contact with the gasket of tapping sleeve, shall be smooth. All rough areas on the pipe barrel shall be smoothed. The Contractor shall field verify all pipe and fitting dimensions. Tapping sleeves shall be installed at least twenty-four (24) inches from bell joints, fittings, end of pipe joint, or another tap.

B. Tapping sleeves shall be bolted securely to the pipe. The face of the outlet shall be plumb. Mechanical joint glands for tapping sleeves shall be installed in accordance with Paragraph 3.06 herein. The bolts for tapping sleeves shall be alternately tightened "snug" and then alternately tightened to a torque as recommended by the manufacturer.

C. The tapping valve shall be bolted securely to the tapping sleeve. The tapping valve shall be adequately supported from beneath. The weight of the tapping valve shall not be supported by the tapping sleeve. A concrete "mud slab" at least six (6) inches thick shall be poured under the location of all tapping valves 12 inches and larger and the weight of the valve shall be supported by the mud slab. The tapping machine shall be bolted securely to the valve.

D. After installation of the tapping sleeve and the tapping valve and before drilling through the pipe, the assembly shall be hydrostatically tested at the pressure specified in Section 5300, herein, by introducing water through the sleeve test tap.

E. The pilot drill and shell cutter shall be in good condition. The pilot, shell cutter, and any other component of the tapping machine that will or may come into contact with the interior of the tap valve or potable water pipe, shall be thoroughly sterilized with straight bleach or super-chlorinated solution. The shell cutter shall be the size required to cut the full opening specified and with a sufficient depth greater than the wall thickness of the pipe being tapped.

F. Openings in the pipe barrel for tapping saddles installed on dry pipe shall be cut with a pilot drill and shell cutter. Torch cutting is not permitted.

G. Tapping operations must not commence before inspection by the Engineer or his authorized representative. Tapping operations must not commence before the tapping assembly has passed a pressure test as detailed in Section 5300 herein.

H. Only qualified operators shall operate the tapping machine. The "coupon" shall be withdrawn and be given to the Engineer for inspection. Care shall be exercised to avoid drilling or cutting

the backside of the pipe by carefully assuring the engagement of the pilot drill and shell cutter shaft.

I. After the tap is complete and the tapping machine has been removed, the bolts for the tapping sleeve must be re-torqued per the manufacturer's specifications to ensure a proper seal.

J. All taps 12-inch and larger shall require the installation of a butterfly valve immediately after the tapping valve. The tapping valve shall be fully opened and abandoned in place.

K The tapping sleeve shall be double poly wrapped.

L. Tapping sleeves shall be adequately thrust blocked with concrete.

3.07 CONCRETE THRUST BLOCKS AND ANCHOR COLLARS

A. Concrete thrust blocks and anchor collars shall be provided along the water line in accordance with the construction details, plan sheets, or as directed by the Engineer. The concrete mix (as defined in Section 3600 herein) shall be Class "1" for anchor collars and Class "1" for thrust blocks. All bends, tees, caps, plugs, and fire hydrants shall be thrust blocked unless specifically detailed in the construction drawings that no thrust blocking is required. All vertical bends shall be both fully restrained and fully thrust blocked. Horizontal bends will be both fully retrained and fully thrust blocked when required by the City.

B. Concrete for thrust blocks and anchor collars shall be placed against undisturbed soil. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust.

C. No concrete shall be placed around any part of a joint or placed so that it interferes with the removal of any joint accessories such as bolts, followers, threads, collars, couplings, etc. Fire hydrant drains shall not be restricted.

D. The top of the concrete thrust block or anchor collar shall be struck off with a wood straight edge or float.

E. Concrete shall not be placed when the temperature is below 40° F and dropping or below 35° F if the temperature is rising, unless approved by the Engineer.

F. Admixtures are not to be used without the approval of the Engineer.

G. All reinforcement shall be inspected by the Engineer prior to placement of concrete. All placement of concrete must be in the presence of the Engineer or his representative. The Contractor is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the Engineer or his representative.

H. Backfill over concrete thrust blocks or anchor collars shall not be placed before the concrete has attained initial set.

I. No thrust blocks shall be less than six inches (6") thick between the pipeline or appurtenances and undisturbed soil in the direction of thrust on pipes 12-inch diameter and smaller. On larger pipes, the thickness of thrust blocks shall be as directed by the Engineer. A thrust block with any component of its length to width to depth ratio exceeding two (2) shall be reinforced with steel reinforcement bars as directed by the Engineer. The Engineer will consider the size of the thrust block, the size of the water main, and the system pressure in the determination of the size and spacing of the steel reinforcement.

J. The excavation shall be free of water before concrete is placed. Steel reinforcement shall be placed as specified on the drawings.

K. The pipe or appurtenances to be in direct contact with concrete shall be cleaned before placing the concrete.

L The area of contact of the thrust blocks and anchor collars shall be sufficient to resist the thrust. This will vary depending on the safe bearing value of the soil.

The Engineer of Record is required to design the thrust blocks, anchors and other restraints and submit to the City for review and approval.

If requested by the City, the engineer of record shall provide a geotechnical report to include soil valves for thrust blocking design.

N. Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

O. Thrust blocks and anchor collars shall be adequate to restrain the pipeline and appurtenances at design pressure equal to 150% of the static pressure at the lowest point with a minimum pressure of 200 psi. The Engineer of Record shall provide calculations for review for all thrust blocks, anchor collars and other thrust restraints.

P. Concrete thrust blocks and anchor collars on 12-inch and smaller pipelines shall have a minimum curing time of three days (72 hours) before any pressure is placed against the block or collar. Concrete thrust blocks and anchor collars on 14-inch and larger pipelines shall have a minimum curing time of seven days before any pressure is placed against the block or collar.

Q. Concrete thrust blocks or anchor collars that fail to restrain the pipe or appurtenances shall be replaced by the Contractor at his expense.

R. Reducers receiving an anchor collar shall be long bodied fittings.

S. All water lines with dead ends shall be installed with an upstream valve, one full joint of pipe with a MJ restraining gland, concrete anchor collar, a MJ cap with restraint, and a blow off assembly. The seat of the MJ restraining gland on the pipe shall face the valve.

T. Anchor collars subject to two-way thrust shall have two identical "A"/"B" reinforcement steel mats as shown in the City Engineering or project specific detailed drawings. Anchor collars for 18" and smaller diameter pipe with two-way thrust shall have two (2) Mega-Lug retaining glands placed back-to-back, spaced just inside the two reinforcing steel mats.

U. The use of wood or any material that may deteriorate is strictly prohibited.

3.08 BACKFILLING AND INSPECTION

A. Before backfilling, install concrete thrust blocks and anchor collars in accordance with the plans and details at the location and interval as shown on the Drawings. Use concrete as specified in Section 3600-Cast-In-Place Concrete.

B. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 2300-Excavation, Backfilling, and Compacting.

C. Test the pipeline per Section 5300-Inspection and Testing of Water Lines and Service Lines.

D. Repair all pavements per Section 6000-Pavement Repair.

E. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.

F. Repair sodded and grass areas to original condition per Section 6100-Lawn and Grass Restoration.

3.09 WATER LINE INSTALLATION - AERIAL CROSSINGS

A. Construct piers as shown on the approved Drawings.

B. Install encasement pipe on piers as shown on the approved Drawings.

C. Insulate encasement as required by the City.

3.10 SEWER LINE CROSSINGS

A. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.

B. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.

C. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. If the water main passes under the sewer main, 18-inches of clearance is still required between pipes. Refer to Section 3400 – Steel Encasement Pipe.

3.11 STORM SEWER CROSSINGS

A. All water lines crossing under all concrete storm drains, or any storm drain 30-inch diameter and larger, or all storm drains with multiple pipe runs, shall be steel encased a minimum of 5 feet either side of the storm drain.

3.12 CUT AND CAP

A. Water lines that are to be abandoned shall be cut and capped as shown on the CIty Engineering standard details.

B. Mechanical joint restraints and concrete shall be used to resist thrust loads.

3.13 ABANDON CORPORATION STOP

A. All corporation stops used for testing and/or chlorination need to be properly abandoned by fully closing the corporation stop, removing all service line materials, installing a solid copper disk, and reinstalling the corporation nut resulting in a water tight seal in the event that the corporation valve fails.

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END OF SECTION 4100

SECTION 4200 WATER LINE PRESSURE REDUCTION PROCEDURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the procedures associated with reducing water line pressure for construction.

1.02 PROCEDURES

A. Water lines may need to have the pressure significantly reduced to facilitate construction in a project area, i.e. tie-ins or cut and caps.

B. Water pressure reductions shall be approved and coordinated with the City of Fayetteville Water & Sewer Department.

C. The maximum amount of time that the line is permitted to be shut down shall be determined by the City of Fayetteville Water & Sewer Department.

D. The Contractor shall have sufficient materials, labor, and necessary backup provisions in place prior to initiating water line pressure reduction to ensure that construction activities can be completed within the time determined by the City of Fayetteville Water & Sewer Department.

E. A minimum of 72-hour notice shall be provided to each affected customer using the attached water pressure reduction notice.

F. The Contractor shall distribute the notices and generate a list of each address that the notices are delivered to. The list shall be given to the City of Fayetteville Water & Sewer Department for their files.

1.02 CONSTRUCTION REQUIREMENTS

A. The excavation in the project area shall be dewatered prior to pressure in the water main being reduced.

B. All water pipe, fittings, and materials shall be disinfected per AWWA C651, latest revision.

C. Immediately after construction is complete, the existing water lines shall be flushed thoroughly and background chlorine levels re-established.

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CITY OF FAYETTEVILLE ARKANSAS

WATER SYSTEM NOTICE TO THE CUSTOMER

WATER PRESSURE REDUCTION

DATE: _____

Due to scheduled water system maintenance in your area, the contractor listed below, under supervision of the engineer listed below, must significantly reduce the water pressure in the area serving your business or residence. The water pressure will be reduced at the following time:

DATE TURNED DOWN: _____

TIME TURNED DOWN (approximate): _____

TIME TURNED BACK ON (approximate): _____

The pressure will probably be reduced such that you will not have water available in your residence or business. We are attempting to make the repairs in this way to avoid having to put your home or business on a precautionary boil order. Your water will be perfectly safe to drink as soon as full pressure is restored.

If the repair does not work as we expect and a boil order becomes necessary, you will be notified, in writing, when the need for the boil order is identified.

If you need to draw water for use, please do so before the time we will be reducing pressure.

If you have any questions, please call one of the following:

Engineer: _____ _____
Company and Contact Name Phone

Contractor: _____ _____
Company and Contact Name Phone

Thank you for your patience and consideration.

Water & Sewer Division
479-575-8386

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END OF SECTION 4200

SECTION 5000 SEWER LINE CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section covers the cleaning of sewer lines.

1.02 SUBMITTALS

A. The Contractor shall submit for approval manufacturer's brochures and specifications for his proposed cleaning equipment. The equipment and methods selected for cleaning shall be approved by the City and the Engineer of Record.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment selected for cleaning shall be of a type generally recognized by the trade for the purpose being used and that has proved satisfactory. The equipment shall be capable of removing all roots, dirt, grease, rock and other deleterious material and obstructions from the sewer lines and manholes that would prevent efficient use of the inspection equipment.

1. Hydraulic cleaning equipment shall be of a movable dam type and shall be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. Sewer cleaning balls or other such equipment which cannot be collapsed instantly will not be considered acceptable cleaning equipment. The moveable dam shall be of the same diameter as the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure total removal of grease. If a line segment is found to be completely stopped up or plugged or heavily intruded with roots, then a mechanical root cutter shall be used.

2. High velocity hydro-cleaning equipment shall be truck mounted for ease of operation. The equipment shall have minimum of 600 feet of 1 inch I.D. high pressure hose with a selection of two or more high velocity nozzles. The nozzles shall have a capacity of 60 GPM at a minimum working pressure of 1000 pounds per square inch (psi). The nozzles shall be capable of producing a scouring action from 15 degrees to 45 degrees in all size lines designated to be cleaned. Equipment shall also have a high velocity gun for washing and scouring manhole walls and floor. The equipment shall carry its own water tank capable of holding corrosive or caustic cleaning or sanitizing chemicals, auxiliary engines, pump and a hydraulically driven hose reel. All controls shall be located so that equipment can

be operated above ground with minimal interference to traffic and/or danger to the operator.

3. Mechanical cleaning equipment shall be used to remove heavy accumulations of silt, sludge, etc., and roots. Bucket machines shall be operated in pairs with each machine powered by an engine with a minimum of 16 horsepower (HP) to ensure sufficient pulling power. Machines shall be capable of operating at least two speeds to match job conditions. Sufficient accessories and tools shall be furnished to accomplish the required cleaning in a complete and efficient manner.

4. Power rodding machines shall be of a continuous rod type, capable of holding a minimum of 1000 feet of rod. The rod shall be specifically treated steel. The machine shall have a positive rod drive and produce a 2000 pound rod pull. To insure safe operation, the machine shall have a fully enclosed body and an automatic safety throw-out clutch.

5. Cleaning equipment shall be provided that includes an air conveying vacuum system to provide for the simultaneous removal of the debris flushed to the manhole.

6. A temporary debris catcher, as approved by the Engineer, shall be used in the downstream manhole.

2.02 PERSONNEL

A. Contractor personnel shall be thoroughly familiar with all phases of sewer line cleaning to insure satisfactory end results without causing damage to the sewer lines or adjacent property.

PART 3 - EXECUTION

3.01 CLEANING EQUIPMENT

A. Since the success of related work depends a great deal upon the cleanliness of the lines, the importance of the cleaning operation cannot be too strongly emphasized. The equipment selected for cleaning shall be capable of removing all dirt, grass, rocks and other deleterious materials from the sewer lines and manholes. Particular emphasis is placed on the removal of grease accumulations so that cracks and breaks can be observed during television inspection and so that joints can be isolated during testing and sealing operations.

B. The Contractor shall make an inspection of the lines to be cleaned in order to determine the type of cleaning equipment that is required. It is anticipated that hydraulic cleaning will be adequate for most of the line segments.

3.02 CLEANING REQUIREMENTS

A. Prior to inspection, the designated sewer lines, as shown on the project drawings, will be thoroughly cleaned as specified below:

1. The sewer lines shall be cleaned by using standard mechanically powered or hydraulically propelled cleaning tools or combinations thereof, such as rodding machines, boring machines, hydraulic balls, cones, ferrets, or other similar devices.

2. All roots, sludge, dirt, sand, rock, grease and other solid or semi-solid material resulting from the cleaning operations shall be removed at the downstream manhole without passing the material from section to section, which could cause stoppage of the lines or accumulation in the wet well and damage to pumping equipment. When cleaning equipment is used, a debris catch riser as shown in the project specific or City engineering standard details shall be used in the downstream manhole so that both solids and water shall be trapped. All solids or semi-solids resulting from the cleaning operations shall be removed from the site and disposed of at no additional cost to the Owner. It the responsibility of the Contractor to secure a legal dump site for the disposal of this material.

3. Satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer lines are used, precautions shall be taken to insure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. The flow of sewage present in the sewer lines shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed or used when there is a fire in the area. Before using any water from the City water supply system, the Contractor shall obtain a hydrant meter from the Meter Department. The Contractor shall be responsible for the water meter and related charges for the setup, including the water usage bill. All expenses shall be considered incidental to cleaning.

4. UNDER NO CIRCUMSTANCES SHALL SEWAGE OR SOLIDS REMOVED THEREFROM BE DUMPED ONTO STREETS OR INTO DITCHES, CATCH BASINS, STORM DRAINS OR SANITARY SEWER MANHOLES.

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END OF SECTION 5000

SECTION 5100 SEWER LINE TELEVISION INSPECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. All new sewer lines constructed shall be inspected via internal television inspection.

B. This section covers the television inspection (closed circuit television inspection – CCTV) of sewer lines.

1. The inspection of each line shall be by a television (TV) camera especially designed to accurately show the condition of the lines from the interior and with the ability determine the depth of water in the event of any pooling and to pinpoint the locations of line faults and necessary repairs.

2. A sewer line joint means the junction of two adjacent lengths of sewer pipe, and a fault is any crack too small to warrant pipe replacement. The term "manhole section" as used in these specifications shall mean the length of pipe connecting two manholes.

1.02 SUBMITTALS

A. The Contractor shall submit for approval manufacturer's brochures and specifications for proposed TV equipment.

1.03 INSPECTION

A. Immediately upon cleaning the sewer line in one location, it shall be televised to determine the condition of the line and location of existing service connections, etc.

B. The sewer lines shall be visually inspected by TV camera. The section being inspected shall be suitably isolated from the remainder of the sewer line as necessary.

C. The camera shall be moved through the line in either direction at a uniform slow rate not to exceed 60 feet per minute, by means of cable winches, or similar mechanisms. Under no circumstances shall the camera be tethered to a hydraulically propelled or high-velocity jet cleaning device while the cleaning device is on.

D. The camera shall stop at each service connection and provide a view up the service line.

E. Telephone, or similar suitable means of communications, shall be set up between the two winches, the pumping unit and the monitor control.

F. Under certain conditions, it may be impossible for inspection equipment to pass through a manhole section due to damaged pipe or other obstructions not correctable by internal methods. In such cases, the Engineer will be notified.

G. TV inspection will be done one manhole section at a time and the flow in the section being inspected will be suitably controlled. Sewer flow will not exceed those shown below as measured in the manhole:

6” - 10” Pipe	1 inch
12” - 14” Pipe	2 inches
14” - 24” Pipe	3 inches
Over 24” Pipe	4 inches

H. The Contractor will make all provisions for pumping or bypassing the flow around the manhole section and the cost shall be incidental to TV inspection. Contractor shall not be allowed to float the camera unless permitted by the City.

I. It is possible that some sections of the sewer line cannot be televised; therefore, house or building connection lines will have to be located on the ground by the Contractor. All cost for locating these service lines shall be included in the cost bid for house or building service line reconnection.

PART 2 - PRODUCTS

2.01 TELEVISION INSPECTION EQUIPMENT

A. The television camera and monitoring equipment shall be specifically designed and constructed to perform the work as specified. The camera shall be operative in conditions of 100% humidity and/or under water. The camera shall be small enough to pass through a 6 inch diameter sewer and shall be waterproof with a self contained lighting system capable of producing enough light to produce clear, bright, sharp pictures on the monitor.

The lighting and camera quality shall be suitable to allow a clear, in focus picture of a minimum of 6 linear feet of the entire inside periphery of the sewer pipe and the measuring device to determine the depth of water in the event of any pooling. Picture quality and definition shall be to the satisfaction of Engineer; otherwise, the equipment shall be removed from the line without pay.

B. The monitor shall be located within a temperature controlled television unit that will accommodate three people to watch the sewer line inspection. The monitor will have a 12-inch minimum viewing screen. The Engineer will have access to view the television monitor at all times.

C. The camera must be capable of measuring depth (in inches) of pooled water within the pipe. This shall be accomplished by measuring equipment mounted directly to the camera in view of the lens, or other methods as approved by the Utilities Director.

PART 3 - EXECUTION

3.01 TELEVISION INSPECTION BY THE CONTRACTOR

A. The Contractor shall furnish video media of the lines televised to the Engineer for review and comments, which may require up to thirty (30) calendar days from the date submittal to the City. Unless approved otherwise by the City, the video media shall be DVD format. Video shall play in a standard DVD player without the need of viewing software. Each video media shall be permanently labeled with the following information furnished:

1. Project Job Number
2. Manhole to Manhole Designation
3. Name of Contractor
4. Date Televised

B. The following information shall be recorded and visible onscreen for 10 seconds immediately before the start of televising each line segment:

1. Project Job Number
2. Manhole to Manhole Designation (Number, Pipe Material, Size of Line, and Direction of Televising)
3. Name of Contractor
4. Date Televised
5. Street and or Easement Location
6. Drawing Sheet Number

C. A continuous uninterrupted recording of distance from the insertion manhole shall be visible at the lower left corner of the screen at all times during inspection.

D. The following information shall be provided in hard copy to accompany each tape:

1. Project Job Number
2. Name of Contractor
3. Date Televised
4. Street or Other Location
5. Upstream Manhole Designation
6. Downstream Manhole Designation
7. Pipe Material

8. Pipe Diameter
9. Direction of Televising (Downstream or Upstream)
10. Continuous Time Log Designating Start and Finish of Each Line Segment Televised. Time shall begin at 0hr 0min 0sec at the beginning of each tape.
11. Location of Service Connections

E. Media will become the property of the City. If the video is of such poor quality that the Engineer is unable to evaluate the condition of the sewer line or to locate service connections, the Contractor will be required to retelevise and provide a good video of the line at no additional cost to the City.

PART 4 - PASS/FAIL CRITERIA

4.01 CRITERIA

A. The PASS/FAIL decision will not be made in the field.

B. The following items will be reviewed during the inspection:

1. Pipe bell ends facing downstream
2. Manhole Inverts:
   Geometry compared to city details. Invert shape, size, and roughness.
3. Service Connections
   Proper placement and connection to pipe per city details and specifications.
4. Loose or missing pipe joint gaskets
5. Pipe Joints not fully seated, or over-inserted.
6. Pipe integrity
   Crushed (or out of round)
   Damaged pipe (cracks, chips, etc.)
7. Pooling of water in the pipe.
   Any pooling of water that is deeper than ¾" will require the sewer main line to be adjusted to eliminate the problem.
8. Debris / Sediment.
   The line should be clear of all sediment and debris.

END OF SECTION 5100

SECTION 5200 INSPECTION AND TESTING OF SEWER LINES, MANHOLES, AND SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the inspection and testing of sewer lines, manholes, and service lines. Holiday testing shall be required on all epoxy lined manholes and sewer wet wells. Testing is required before final acceptance of sewer lines and service lines by the City.

B. If more than two (2) repairs are necessary on any 100-foot segment of sewer line (gravity or force main) then the repairs may not commence until the Engineer of Record has provided a report explaining the deficiencies and outlining a custom plan of repair, remediation, or replacement. This document must be approved by the City of Fayetteville prior to further disturbances to the utility.

1.02 SCOPE OF WORK

A. All pipelines shall be inspected and tested before final acceptance. The methods to be used are as follows:

1. New Gravity Sewer Lines

    a. Visual inspection during installation and before backfill.
    b Low pressure air test.
    c. Television inspection.
    d. Mandrel test (Flexible pipes only)
    e. Final Visual Inspection
    f. Infiltration/exfiltration
    g. Tracer wire continuity test.

2. Manholes

    a. Visual inspection during installation and before backfill.
    b. Vacuum testing.
    c. Final visual inspection.
    d. Holiday test (epoxy coatings).
    e. Cored connection dye-testing

3. Replacement Sewer Lines and Point Repairs

    a. Visual inspection during installation and before backfill.
    b. Low pressure air test/exfiltration, infiltration.
    c. Television inspection.
    d. Mandrel test.
    e. Final visual inspection.

4. Force Mains

   a. Visual inspection during installation and before backfill.
   b. Hydrostatic pressure test.
   c. Tracer wire continuity test.

5. Service Lines

   a. Visual inspection during installation and before backfill.
   b. Low pressure air test.
   c. Exfiltration test.

1.03 DELIVERABLES

A. The Engineer shall provide a complete and comprehensive testing report summary complete with all inspection and testing dates and results.

PART 2 - PRODUCTS

A. As specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 VISUAL INSPECTION DURING INSTALLATION AND BEFORE BACKFILL

A. The Engineer shall be responsible for inspecting sewer lines, manholes, and service lines during all phases of construction. The Engineer shall provide comprehensive inspection services. All work not conforming to these specifications that is discovered during this inspection phase will be corrected by the Contractor.

3.02 PRESSURE TEST FOR GRAVITY SEWER PIPELINES

A. The Contractor will perform pressure tests on all gravity sewer lines.

B. Lines will not be accepted until they pass all required tests.

C. Perform the tests in the presence of the City representative. Provide at least 48 hours' notice before beginning testing.

D. The primary test method is the Low Pressure Air Loss test.

3.03 LOW PRESSURE AIR LOSS PROCEDURE FOR GRAVITY SEWER PIPELINES

A. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

B. Pipe air supply to pipeline to be tested so that air supply may be shut off, pressure observed, and air pressure released from the pipe without entering the manhole. Install a valved

branch in the supply line past the shut-off valve terminating in a 1/4" female pipe thread for installation of the test gauge.

C. Add air slowly to portion of pipe under test until test gauge reads at least 4 psig, but less than 5 psig.

D. Shut air supply valve and allow at least two minutes for internal pressure to stabilize.

E. The pressure shall then be decreased to 3.5 psig.

F. Upon reaching 3.5 psig, the time in minutes, seconds for the pressure to fall 1 psig so that pressure at the end of time of the test is at least 2.5 psig shall be observed.

G. Compare observed time with minimum allowable times in the following chart for pass/fail determination.

TEST CHART FOR AIR TESTING SEWERS
Leakage Testing of Sewers by Low Pressure Air Loss
(Time Pressure Drop Method)

Table 1 - Minimum Test Times in Minutes.Seconds for 1 psig drop (3.5 psig to 2.5 psig)										
Distance Between Manholes	Nominal Pipe Diameter (inches)									
	8	10	12	15	18	21	24	30	36	42
100	7.33	9.26	11.20	14.10	17.00	19.49	22.47	35.36	51.17	69.48
150	7.33	9.26	11.20	14.10	17.00	26.1	34.11	53.25	76.55	104.42
200	7.33	9.26	11.23	17.48	25.38	34.54	45.35	71.13	102.34	139.36
250	7.33	9.53	14.14	22.15	32.03	43.37	56.59	89.02	128.12	174.3
300	7.35	11.52	17.05	26.42	38.27	52.21	68.22	106.5	153.51	209.24
350	8.51	13.51	19.56	31.09	44.52	61.04	79.46	124.39	179.29	244.19
400	10.07	15.49	22.47	35.36	51.17	69.48	91.10	142.27	205.08	279.13
450	11.23	17.48	25.38	40.04	57.41	78.31	102.34	160.16	230.47	314.07
500	12.39	19.47	28.29	44.31	64.06	87.15	113.58	178.04	256.25	349.01
550	13.55	21.45	31.20	48.58	70.31	95.58	125.21	195.52	282.04	383.55
600	15.11	23.44	34.11	53.25	76.55	104.42	136.45	213.41	307.42	418.49

H. Where groundwater level is above the crown of the pipe being tested, increase test pressure at the rate of 1 psi for every 2.5 feet of water above the crown.

I. Air Testing Safety Requirements:

1. Securely brace plugs used to close the sewer pipe for the air test; this is to prevent the unintentional release of a plug which can become a high velocity projectile. For example: four pounds (gauge) air pressure develops a force against the plug in a

12" diameter pipe of approximately 450 pounds; this force can propel a 12-inch plug weighing 10 pounds to supersonic speeds.

2. Locate gauges, air piping manifolds, and valves at the top of the ground. Entry by anyone into a manhole where a plugged pipe is under pressure is strictly prohibited.

3.04 HOLIDAY TESTING FOR EPOXY LININGS

A. High voltage holiday detection for coating systems installed in corrosive environments, when it can be safely and effectively employed, shall be performed to ensure monolithic protection of the substrate. After the coating product(s) have cured in accordance with manufacturer recommendations, all surfaces shall be inspected for holidays in accordance with NACE RPO 188-99, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates. All detected holidays shall be marked and repaired according to the coating product(s) manufacturer's recommendations.

B. Test voltage shall be a minimum of 100 volts per mil of coating system thickness.

C. Detection of a known or induced holiday in the coating product shall be confirmed to ensure proper operation of the test unit.

D. All areas repaired shall be retested following cure of the repair material(s).

E. In instances where high voltage holiday detection is not feasible a close visual inspection shall be conducted and all possible holidays shall be marked and repaired as described above.

F. Documentation of areas tested, equipment employed, results, and repairs made shall be submitted to the City/Engineer by Contractor.

3.05 TELEVISION INSPECTION

A. The Contractor shall televise all newly installed sewer mains as follows:

1. Television inspection shall be performed no less than 30-days after the pipe has been backfilled. Inspection shall be performed after mandrel testing, if applicable.
2. The Contractor shall clean all lines thoroughly prior to the start of televising.
3. Prior to performing the video test, 5 gallons of clean water per 100 feet of sewer line shall be poured down the sewer main in order to highlight low spots.
4. The Contractor shall televise each segment of pipe.
5. The Contractor shall review the video for possible defects in material or workmanship.
6. The Contractor shall correct any defects discovered during the television inspection at the Contractor's expense.
7. The Contractor shall deliver to the Engineer final video and logs after all defects have been repaired.

3.06 MANDREL TEST

A. Mandrel testing shall be performed no less than 30-days after the pipe has been backfilled.

B. The maximum allowable pipe deflection is five (5) percent of the inside pipe diameter.

C. Any sewer pipe which fails the mandrel test prior to final acceptance will not be accepted by the City until the defects are corrected.

D. All mandrel tests shall be performed by the Contractor while observed by City personnel.

3.07 SUPPLEMENTAL MANDREL TESTING

A. The City may at any time after final acceptance perform supplemental mandrel testing on pipelines constructed of flexible pipe material. These supplemental tests will be performed as detailed above with a maximum allowable long term deflection of five percent (5%).

B. Any sewer pipe which fails the mandrel test prior to expiration of the maintenance bond will be corrected by the Contractor at the Contractor's expense. If the Contractor fails to correct these defects after a reasonable time, the City will correct the defects and file a claim with the bonding company.

3.08 FINAL VISUAL INSPECTION

A. Upon completion of the above tests the Engineer will perform a final visual inspection of sewer lines and manholes.

B. A punch list of defects (including obvious running leaks) will be prepared and sent to the Contractor for correction at the Contractors' expense.

3.09 INSPECTION FOR SERVICE LINES

A. All building sewer installations shall be inspected and approved by an authorized City inspector.

B. Backfill may only be placed on the completed portions of a building sewer following inspection. No approval certificate shall be issued until all portions of a building sewer from the main connection to the building foundation have been inspected and approved by an authorized inspector. At the time of inspection, the pipe should be in place in the trench with the top half of the pipe barrel exposed. No approval will be given for building sewers all or a portion of which are covered at the time of inspection.

C. All building sewers are subject to testing to insure water tightness. All tests must be performed in the presence of the Engineer. Tests may be either by:

1. Water Loss Test Procedure; or,

2. Low Pressure Air Loss Procedure.

D. If, in the opinion of the Engineer, the line in question is properly installed and free from open joints and breaks, building sewers constructed entirely of cast iron soil pipe may be connected to the city sewer without testing.

E. Low Pressure Air Loss Procedure

1. Plug securely both ends of the line to be tested.
2. Charge the line with air to a pressure of 4.5 psig.
3. Allow at least five minutes for the temperature in the pipe to stabilize.
4. Measure the time required for a one (1.0) psi drop in pressure.
5. The minimum time for a one psi loss is 28.5 x d seconds where d = the nominal diameter in inches of the pipe being tested.

3.10 PRESSURE TEST FOR FORCE MAINS

A. Perform hydrostatic leakage tests for force mains the same as water pipe, see Section 5300, by filling the force main with water and increasing the pressure to a testing pressure of 150% of the working pressure with a minimum of 100 psi and a maximum pressure of 250 psi.

B. The duration of the leakage test shall be two hours.

C. The maximum allowable leakage rate shall be 1 gallon per foot diameter of pipe per 1000 feet of force main for the duration of the 2 hour test.

D. The force main will not be accepted until the actual leakage is equal to or less than the allowable. In addition, all obvious leaks shall be repaired.

3.11 MANHOLE TESTING

A. The Contractor shall vacuum test all new manholes constructed.

B. Precast manholes shall be vacuum tested prior to backfill.

C. The Contractor shall vacuum test all manholes that have been sealed (waterproofed).

D. The Contractor shall vacuum test all manholes that have been epoxy lined.

E. Manholes shall be tested in accordance with ASTM C 1244, latest edition. Vacuum test shall not be performed earlier than 7 days after construction for cast in place manholes. The Contractor shall provide all testing equipment, pump, hosing, seal, and other incidentals. Vacuum test head shall be positioned at the top of the casting (the surface on which the manhole cover rests, to include grade rings) in accordance with the equipment

manufacturer's instructions. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump isolated by the shut-off valve on the test head connection. When valve is closed, time measurement shall commence, and the time required for vacuum drop to 9-inches of mercury shall be observed and recorded. Manholes shall pass if the time for the vacuum reading to drop from 10-inches of mercury to 9-inches of mercury meets or exceeds the time values in seconds in the following table.

Table 2 - Minimum Test Times for Various Manhole Diameters (seconds)									
Depth (feet)	Diameter (inches)								
	30	33	36	42	48	54	60	66	72
<10	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	57	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	70	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

F. Manholes showing greater than the allowable leakage shall be repaired and re-tested until a satisfactory leakage result is obtained.

G. If a main or service line connection is cored or cut into a new or existing manhole, this connection must be dye-tested to verify no infiltration/inflow is permitted at the connection. A biodegradable, non-hazardous food-grade dye must be utilized. Dye must encompass the new connection, on the outside of the manhole for a period of 1-hour without any dye entering the manhole, based on visual inspection. If a vacuum test can be performed on the manhole, no dye test will be required at the new connection.

3.12 TRACER WIRE CONTINUITY TESTING

A. Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or the Engineers' representative. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at their own expense.

B. A final continuity test shall be performed by a Water and Sewer Department representative before the project will be accepted by the City. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at his own expense.

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END OF SECTION 5200

SECTION 5300 INSPECTION AND TESTING OF WATER LINES AND SERVICE LINES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the inspection/observation and testing of water lines and services lines. Testing is required before final acceptance of water lines and service lines by the City.

B. If more than two (2) repairs are necessary on any 100-foot segment of water line then the repairs may not commence until the Engineer of Record has provided a report explaining the deficiencies and outlining a custom plan of repair, remediation, or replacement. This document must be approved by the City of Fayetteville prior to further disturbances to the utility.

1.02 SCOPE OF WORK

A. All pipelines shall be inspected and tested before final acceptance. The methods to be used are as follows:

1. New Water Pipelines

    a. Visual inspection during installation and before backfill.
    b Hydrostatic pressure test.
    c. Disinfection.
    d. Bacteriological sampling.
    e. Final Visual Inspection.
    f. Tracer wire continuity test.

2. Water Meter Setters

    a. Visual inspection during installation and before backfill.
    b. Final Visual Inspection.

3. Service Lines

    a. Visual inspection during installation and before backfill.
    b Hydrostatic pressure test.
    c. Final Visual Inspection
    d. Tracer wire continuity test.

1.03 DELIVERABLES

A. The Engineer shall provide a complete and comprehensive testing report summary complete with all inspection and testing dates and results.

PART 2 - PRODUCTS

A. As specified elsewhere within these Standards.

PART 3 - EXECUTION

3.01 VISUAL INSPECTION DURING INSTALLATION AND BEFORE BACKFILL

A. The Engineer shall be responsible for observing/inspecting water lines, water meter setters, and service lines during all phases of construction. The Engineer shall provide comprehensive observation/inspection services. All work not conforming to these specifications that is discovered during this inspection phase will be corrected by the Contractor.

3.02 PRESSURE TEST FOR TAPPING SLEEVES

A. The contractor shall provide all pumps or other equipment necessary to test the tapping sleeve before making a tap. The duration of the hydrostatic leakage test on tapping sleeves shall be thirty (30) minutes at 225 psi with zero leakage.

3.03 PRESSURE TEST FOR WATER PIPELINES AND SERVICE LINES

A. After completion of construction of all water lines or sections thereof, the Contractor shall flush, test and disinfect the new water lines in accordance with the Engineer of Record's plan and as described below.

B. Flushing

1. All water for flushing, testing and disinfecting water lines shall be supplied and paid for by the Contractor. Water meters shall be obtained from the City of Fayetteville Meter Division. Water used for high rate flushing shall not be metered through a contractor issued water meter. Actual water flow rates used during flushing operations shall be determined by the City of Fayetteville by using either pitot style gauges or high rate water meters. Volume shall be determined by multiplying the measured flow rate times the duration of flushing in minutes. Water used for flushing shall be billed to the contractor at the current wholesale water rate plus applicable taxes.

2. The work shall be coordinated to ensure that it will not be carried on during periods of high water usage. Water valves or other appurtenances on the existing water system, new tapping valves, or valves or appurtenances that have been accepted by the City, shall only be operated by a City employee who has a valid ADH Water Operator's License and under the direct supervision of the City of Fayetteville Water & Sewer Maintenance Division.

3. The Contractor shall fill and flush the newly constructed lines and visually check all combination air release and vacuum valves, blow-off valve assemblies, line valves, fire hydrants, and meter setters to assure proper operation.

4. The Engineer of Record shall develop a flushing plan to ensure that all lines are properly flushed. The plan should specify the sequence in which valves and hydrants are to be opened and the duration thereof, ensuring complete flushing and protecting the City's water system from construction contaminated water. The volume to be flushed shall be no less than three (3) but no more than five (5) times the volume of the main to be flushed, and shall be metered by the City. The flow shall be such that a flushing velocity of not less than 2.5 feet per second and preferably 3.5 feet per second or greater is attained.

C. Hydrostatic Testing

1. All pipe shall be tested as set out in AWWA C600, latest revision. Tests will be conducted only after the line is completed, including all taps and meter settings as required and the backfill completed. These tests shall be performed by the Contractor in the presence of the City Inspectors and the Engineer of Record. The Contractor shall furnish all necessary pressure gauges, meters, and pumps and make all taps and connections.

2. Each valved section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Before applying the test pressure, all air shall be expelled from the pipe by permanent taps or corporation cocks where necessary.

3. Test pressure shall be either 150 percent of the static pressure at the lowest points or 200 psi, whichever is greater, not to exceed 250 psi at the lowest point. The contractor shall provide all pumps or other equipment necessary to maintain the test pressure within +/-5 psi at the test point for a period of two (2) hours. All interior valves including guardian valves on fire hydrants and other appurtenances shall be open during all tests.

4. The test pressure shall not vary by more than ± five (5) psi for the duration of the test. During the duration of the two hour test, if the test pressure drops more than 5.0 psi from the start pressure, the test shall be terminated and considered failure due to assumed leaks in the tested pipe section. If the pressure rises beyond the allowed 5 psi variance, the test shall be terminated and remaining air shall be purged from the pipeline.

D. Leakage

1. The leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the above

specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2. The maximum allowable leakage volume shall be per AWWA standards for PVC and Ductile Iron pipes. For PVC pipe see AWWA C605 Table 2, for Ductile Iron pipe see AWWA C600 Table 4.A.

3. Upon completion of a two hour test where the test pressure did not vary by more than ± five (5) psi, the CONTRACTOR shall determine the leakage amount by measuring the amount of "make-up" water necessary to restore the original starting pressure.

4. Should any test of pipe laid disclose leakage greater than that specified, the leak(s) shall be located and repaired and the line shall be re-tested at the Contractor's expense. All visible leaks shall be repaired regardless of the amount of leakage. It may be necessary to utilize leak detection equipment to locate not visible leaks at the Contractor's expense.

3.04 DISINFECTION

A. After successful pressure testing, the line(s) shall be flushed at a velocity equal to or greater than 2.5 feet per second. The line shall then be disinfected in accordance with AWWA C651, latest revision, for Disinfecting Water Mains, continuous feed method, except that the placing of hypochlorite granules into the main during construction will not be permitted.

B. The Contractor shall provide a test/chlorine tap no greater than 10' downstream from the beginning of the new water line. All excavation, installation, use of and proper abandonment of the test tap is the responsibility of the Contractor.

C. The final concentration of chlorine inside the main shall be 25 parts per million (ppm) at all locations and shall be maintained for a minimum of 24 hours. The chlorine residual at the end of the 24 hour period shall not be less than 10 ppm. The contractor shall supply all test kits necessary to verify chlorine concentrations.

D. The contractor shall operate all valves and hydrants in the treated section of water line during the initial 24 hours to ensure disinfection of the appurtenances.

E. The contractor shall take great care when flushing the line to assure proper drainage is available to prevent harm at any adjacent downstream location.

F. Disposal of the disinfecting water shall be in a manner that will protect the public and the receiving waters from harmful concentrations of chlorine. Decholorination of the disinfecting water shall be in accordance with AWWA C655, Field Dechlorination, latest edition. A dechlorination plan shall be prepared by the Engineer of Record.

G. After disinfection is complete, the Contractor shall then flush the disinfecting solution from the lines to a point that the chlorine concentration is back down to the same level as the treated water from the distribution system. The treated water lines will then be tested before being placed into service.

3.05 BACTERIOLOGICAL SAMPLES

A. Bacteriological samples shall be taken by City personnel only. Samples shall be taken on two consecutive days and shall be taken only on Monday, Tuesday, Wednesday, or Thursday. Before a line is placed in service, two consecutive series of samples which are not collected on the same day and are taken no more than 4 days apart must show that the water is bacteriologically safe for drinking purposes.

3.06 FINAL VISUAL INSPECTION

A. Upon completion of the above tests the Engineer will perform a final visual inspection of water pipelines and meters.

B. A punch list of defects (including obvious running leaks) will be prepared and sent to the Contractor for correction at the Contractors' expense.

3.07 TRACER WIRE CONTINUITY TESTING

A. Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or the Engineers' representative. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at their own expense.

B. A final continuity test shall be performed by a Water and Sewer Department representative before the project will be accepted by the City. If the tracer wire is found to be not continuous during testing, Contractor shall repair or replace the failed segment of wire at his own expense.

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END OF SECTION 5300

SECTION 6000 PAVEMENT REPAIR

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the materials and procedures used in the repair of roads, streets, or other public rights-of-way where a water lines, sewer lines or appurtenances are constructed as part of private or development projects.

B. Capital Improvement Projects and City maintenance projects are not a standard specification. Capital Improvement Projects and City maintenance projects will be considered only on specific case by case basis in accordance with Section 1000 General Requirements.

1.02 REGULATIONS AND STANDARDS

A. All permanent repairs of streets, roads, trails, sidewalks, other public rights-of-way, private drives, private parking lots, etc. shall comply with the requirements shown on the City Engineering Standard Detail Drawings and as further defined in the City's Minimum Street Standards and details. Also refer to:

http://www.fayetteville-ar.gov/445

B. The Contractor is responsible for following the requirements of all State or local Ordinances, Regulations, or Codes governing the repairs to roads, streets, or other public rights of way. In particular:

1. Repair of State Highways: per requirements of the Arkansas Department of Transportation.

2. Repair of county roads: per requirements of the Washington County Road Department.

3. Repair of City of Fayetteville streets, sidewalks, and driveways: per the requirements of the City of Fayetteville.

4. Permit for street cut and repairs shall be furnished by the Contractor.

C. Temporary Repairs: Comply with Section 1000 General Requirements and as follows.

1. Per requirements of the governmental agency having jurisdiction and these specifications.

1.03 TRAFFIC CONTROL

A. Comply with Section 1000 General Requirements and as follows.

A. Whenever traffic flow restrictions of any kind are anticipated, the Contractor will be required to contact the City of Fayetteville Engineering Division to be given permission to obstruct traffic flow.

B. Street closing permits must be obtained from proper government agencies.

C. Construction signs shall be placed immediately adjacent to the Work, at such locations as traffic demands.

D. Contractor will be required to submit a Traffic Control Plan to City of Fayetteville and the Engineer.

END OF SECTION 6000

SECTION 6100 LAWN AND GRASS RESTORATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section covers the replacement of native grass or sod in lawns disturbed by the construction.

B. Consists of furnishing and applying fertilizer, seed, mulch cover, and water at all other locations disturbed by the construction.

C. Maintenance service.

1.02 SCOPE OF WORK

A. This Section covers the furnishing and placing of sod to form solid mats on areas shown on the Drawings (generally lawns or commercial green spaces) or seed and mulch all other areas disturbed by the Contractor.

B. It covers the furnishing and applying of water.

C. It covers the furnishing and placing of four (4) inches of topsoil on all areas disturbed during construction.

D. It covers the furnishing and placing of fertilizer.

E. All work shall be in accordance with details shown on the Drawings and within these Specifications.

F. The Contractor is responsible for following the requirements of all local Ordinances, Regulations, or Codes governing re-vegetation and slope stabilization,

1.03 WARRANTY

A. Provide one year warranty from date of final acceptance.

B. Replace areas found dead, or not in a healthy growing condition.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be reasonably free from subsoil, clay, lumps, brush, objectionable weeds and/or other litter and shall be free from roots and toxic substances or other material or substances that might be harmful to plant growth or be a hindrance to grading, planting and maintenance operations.

2.02 FERTILIZER

A. Fertilizer shall be a standard commercial product complying with State and Federal laws and with the requirements issued by proper authorities.

B. Fertilizer shall be delivered to the site in the manufacturer's original container, on which shall be plainly marked the manufacturer's name and the guaranteed chemical analysis.

C. Except as noted in the following sentence, fertilizer shall contain not less than the percentages by weight of ingredients as follows:

Nitrogen	- 13 percent
Phosphorus, P205	- 13 percent
Potash, K2	- 13 percent

Other 1:1:1 ratio fertilizers may be used, provided the available plant food remains the same as herein specified.

D. All fertilizer shall be solid and shall be in a condition which will permit proper distribution.

2.03 SOD

A. Solid sod shall be cut from well-established viable Bermuda, Zoysia or St. Augustine grass. Sod type shall match that established in the disturbed areas.

2.04 SEED

A. Contractor shall apply seed mixture appropriate for the season and disturbed area.

B. Contractor shall apply a mixture of various annuals and perennials to provide overlapping times of seasonal peak vegetative cover. Seeding shall only be done just prior to the vegetation’s peak season for best results. Seeding shall be used when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control.

C. To optimize soil stabilization, Contractor shall utilize a nurse crop of quick growing annuals within a mix of perennials appropriate for the season. The nurse crop germinates and grows rapidly, holding the soil until the slower-growing perennial seedlings become established. Permanent vegetation shall not be considered established until a ground cover of perennial vegetation is achieved that is uniform and mature enough to survive and be of sufficient density to preclude erosion.

D. Contractor shall conduct seeding activities to achieve stabilization that are generally congruent with the following schedule:

Dormant Cold Season Temporary Stabilization (November 1 – February 28)

Seeding at this time of the year typically does not produce successful results, as cold temperatures inhibit seed germination. Contractor shall be responsible for achieving temporary stabilization via mulching, erosion control blankets, matting, compost, and/or other appropriate structural/nonstructural methods for temporary stabilization until seasonal weather conditions become more conducive to establishment of permanent perennial vegetative cover. Fertilizers shall be added at this time in preparation for seeding. Contractor shall be responsible for achieving temporary stabilization at all areas that are unstable and subject to erosion. Contractor shall apply temporary seeding, as follows:

Dormant Cool Season Temporary Cover Crop Seed Mix (November 1 – February 28)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Winter rye (*Secale cereale)*	cool season annual	75 lb/ac
Perennial Ryegrass *(Lolium perenne)*	cool season perennial	75 lb/ac

Pre Warm Season (Spring) Seeding (March 1 – May 31)

As the growing season approaches, Contractor shall apply a mix of quick germinating cool season species combined with warm season species listed below. The cool season species will serve to hold the soil until warmer weather arrives stimulating the warm season species to germinate.

Pre Warm Season (Spring) Seed Mix (March 1 – May 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Oats (*Avena sativa)*	cool season annual	20 lb/ac
Perennial Ryegrass (*Lolium perenne)*	cool season perennial	20 lb/ac
White clover (*Trifolium repens)**	cool season perennial	20 lb/ac
Korean (Kobe) lespedeza (*Kummerowia stipulacea)**	warm season annual	20 lb/ac
Bermuda (*Cynodon dactylon)*	warm season perennial	30 lbs/ac
Bahiagrass (*Paspalum notatum)*	warm season perennial	30 lbs/ac
Weeping love grass (*Eragrostis curvula)*	warm season perennial	30 lbs/ac

*All legume seed must be properly inoculated with appropriate inoculant.

Warm Season Seeding (June 1 – August 31)
In the midst of the growing season, Contractor shall apply a mix of warm season annuals and perennials, as follows:

Warm Season Seed Mix (June 1 – August 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Sudan grass *(Sorghum bicolor)*	warm season annual	20 lb/ac
Alyce clover *(Alysicarpus ovalifolius)*	warm season annual	20 lb/ac
Brown-top millet *(Panicum ramosum)*	warm season annual	20 lb/ac
Bermuda (*Cynodon dactylon)*	warm season perennial	25 lbs/ac
Bahiagrass (*Paspalum notatum)*	warm season perennial	25 lbs/ac
Weeping love grass (*Eragrostis curvula)*	warm season perennial	25 lbs/ac
Buffalo grass (*Bouteloua dactyloides)*	warm season perennial	25 lbs/ac

Late Season Seeding (September 1 – October 31)
During late summer to early fall, Contractor shall apply the following mix:

Late Season Seed Mix (September 1 – October 31)

Plant Species	Growth Season/ Life Cycle	Seeding Rate
Oats (*Avena sativa)*	cool season annual	30 lb/ac
Winter rye (*Secale cereale)*	cool season annual	30 lb/ac
White clover (*Trifolium repens)**	cool season perennial	25 lb/ac
Perennial Ryegrass *(Lolium perenne)*	cool season perennial	50 lb/ac
Virginia wildrye (*Elymus virginicus)*	cool season perennial	25 lb/ac

*All legume seed must be properly inoculated with appropriate inoculant.

E. Contractor has option of adding warm season perennials to Late Season Seed Mix (September 1 – October 31) and/or Dormant Cool Season Temporary Cover Crop Seed Mix (November 1 – February 28) or seeding with warm season perennials during other seeding periods. This is to be determined on a site-specific basis. Contractor shall confer with City of Fayetteville prior to seeding activities to determine specific seed mix.

F. Contractor shall submit all labels/tags from seed bags and seed purchase invoices to the City of Fayetteville.

2.05 MULCH

A. Mulching shall be used in conjunction with both temporary and permanent seeding practices to enhance their success by providing erosion protection prior to the onset of vegetative growth. Straw mulching shall be of oat, wheat, or rice straw mulch. Hay mulch shall be prairie grass, Bermuda grass, or other hay as approved. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.

B. Mulching shall be spread in a uniform continuous blanket, at a rate of 1 to 3 tons per acre (air dried weight) or to a uniform 2-inch depth. Mulch shall be spread by hand or by an

approved blower type mulch spreader. Care shall be taken to remove all wire and/or twine from baled hay/straw when the control structures are removed from the site. Mulch shall be anchored in the soil to a depth of two to three inches to form a soil-binding mulch to prevent loss or bunching, or held in place with a tackifier.

2.06 WATER

A. Water shall be free from any substances, in solution or in suspension, which would inhibit the rapid growth of grass.

PART 3 - EXECUTION

3.01 FERTILIZER APPLICATION

A. Fertilizers shall be applied at appropriate agronomic rate. If necessary to achieve final stabilization, fertilizer shall be applied at a minimum rate of 250 pounds per acre (0.0057 pounds per square foot) in advance of tilling/seedbed preparation operations. When soil samples are not practical, fertilizer shall consist of 13-13-13 (nitrogen, phosphorus, and potassium content). The fertilizer distributor box shall be equipped with baffle plates to prevent downward movement of fertilizer when operating on a slope. The fertilizer shall be raked in and thoroughly mixed with the soil to a depth of approximately 2 inches prior to the application of seed or mulch.

3.02 SEEDING

A. Areas to be seeded shall be dressed to natural shape.

B. The Contractor shall obtain an approved topsoil from any available source and place uniformly on the designated areas and spread evenly to a minimum thickness of four (4) inches. Irregularities in the surface shall be corrected so as to prevent formation of depressions where water will stand. TOPSOIL SHALL NOT BE PLACED WHEN THE SUBGRADE IS FROZEN, EXCESSIVELY WET, OR IN A CONDITION DETRIMENTAL TO THE PROPOSED PLANTING AND PROPER GRADING.

C. Broadcast sowing of seed may be accomplished by hand seeders or by approved power equipment. Either method shall result in uniform distribution and no work shall be performed during high winds. The area seeded shall be lightly firmed with a cultipacker immediately after broadcast.

D. The contractor shall water and maintain seeded areas from time of completion until final acceptance of the project.

E. The contractor shall be responsible for establishing ground cover on all disturbed areas. Repeated seeding shall be required if necessary throughout the warranty period.

3.03 SOD PLACEMENT

A. In this paragraph, "Solid Sod" is interchangeable with the word "sod."

B. Solid sod or topsoil shall not be placed until all other items of work are complete.

C. Prior to placing the sod and topsoil in the areas designated, the ground surface shall be cleared of materials that might hinder proper grading, tillage, or subsequent maintenance operations such as stumps, stones, roots, cable, wire, grade stakes, etc., and brought to four (4) inches below the finished grade. The areas shall then be thoroughly tilled to a depth of at least two (2) inches by plowing, disking, harrowing or other acceptable means.

D. The Contractor shall then obtain an approved topsoil from any available source and place uniformly on the designated areas and spread evenly to a minimum thickness of four (4) inches. Irregularities in the surface shall be corrected so as to prevent formation of depressions where water will stand. TOPSOIL SHALL NOT BE PLACED WHEN THE SUBGRADE IS FROZEN, EXCESSIVELY WET, OR IN A CONDITION DETRIMENTAL TO THE PROPOSED PLANTING AND PROPER GRADING.

E. After the topsoil has been spread and graded, the surface shall be cleared of stones, stumps or other objects that might hinder planting or maintenance preparations. Paved areas over which hauling operations are conducted shall be kept clean.

F. Where any portion of the surface becomes gullied or otherwise damaged, the affected areas shall be repaired to the aforementioned condition.

G. Areas to be sodded shall be shaped in such manner that they will, after placement of sod, conform to the typical sections.

3.04 WATERING

A. Prior to placement of seed or sod, areas shall be sprinkled with water sufficiently to make them moist, but not muddy. The initial application of water may be omitted if the area is sufficient moist from rainfall.

B. Immediately following the placing and tamping of sod, the covered area shall be wetted thoroughly. **Subsequent applications of water shall be as required**.

C. Immediately following the application of the mulch cover for seeding, water shall be applied in sufficient quantity to thoroughly moisten the soil to the depth of pulverization and then as necessary to germinate the seed and maintain growth.

3.05 COMPLETENESS

A. The lawn and grass operations shall not be considered complete until a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 80% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures.

3.06 INTERMITTENT CLEANUP

A. Immediately following the lawn and grass restoration operations, all gutters, sidewalks, driveways, street pavement, yard or other areas shall be cleaned of all debris, excess sod, topsoil or other objectionable matter. All such cleanup operations shall be completed before sodded areas are measured for payment.

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END OF SECTION 6100

SECTION 6200

REPORTING FORMS

The following forms may be revised and/or additional forms added as determined by the Utilities Director or City engineer.

It is the Contractor's responsibility to request the latest edition of Reporting Forms.

Fire Hydrant Information Sheet

City of Fayetteville

Hydrant ID: _____ (Assigned by Water/Sewer)

Manufacturer: _____ (Mueller, Waterous, Other)

Address: _____ (Nearest House Number)

Model: _____

Street: _____ (Street Name)

Year: _____

Cross Street: _____ (Nearest Cross Street)

Installation Date: _____

Main Diameter: _____

Installed By: _____ (City or Contractor Name)

Feeder Diameter: _____

Static Pressure: _____ psi

Depth of Bury: _____ (Include Extensions)

Ownership: _____ (City, Private, WWA, Other)

Number of Nozzles: 3 2 Other:____

Nozzle Diameters: 4 1/2"-_____; 2 1/2"-_____; Other-_____

Fire Flow Data

Pitot Pressure: _____ psi

Measured Flow: _____ gpm

20 psi Residual Flow: _____ gpm

Current Color: Blue Green Orange Red Other:_____

Residual Flow is 1500 gpm > - Blue; 1000 to 1499 - Green; 500 to 999 - Orange; < 500 - Red

Correct Color: _____

Secondary Fire Hydrant for Test

Hydrant ID: _____

Static Pressure: _____ psi

Residual Pressure: _____ psi

Date of Flow Test: _____

Initials of Testor: _____

Date of Inspection: _____

Initials of Inspector: _____

Date of Maintenance: _____

Intitials of Maint.: _____

Notes: _____

Water Line Flushing Form

City of Fayetteville

Test Date:	Contractor / Superintendent:
Project Name:	
City Project Number:	Engineer / Inspector:
Location:	

Pipe Diameter (inches)	Total Length of Pipe (feet)	Volume (gallons)	Start Time	Flushing Rate min. 2.5 fps (gpm)	Measured Flushing Rate (gpm)	End Time	Volume (gallons)

Diameter (inches)	Volume (1000')	gpm at 2.5 fps
2	163	24
3	367	55
4	653	98
6	1469	220
8	2611	392
12	5875	881

City of Fayetteville

Water Pressure and Leakage Test Form

City of Fayetteville

Test Date:	Contractor / Superintendent:
Project Name:	
City Project Number:	Engineer / Inspector:
Location:	

Pipe Diameter (inches)	Total Length of Pipe (feet)	Test Pressure (psi)	Allowable Leakage (gallons)	Start Time	Start Pressure (psi)	End Time	End Pressure (psi)	Make-up Volume (gallons)	Pass or Fail

D (inches)	Allowable per 1000'
6	0.50
8	0.67
10	0.83
12	1.00
14	1.17
16	1.33
18	1.50
20	1.67
24	2.00
36	3.00
42	3.50

City of Fayetteville

Water Line Disinfection Form

City of Fayetteville

Test Date:	Contractor / Superintendent:
Project Name:	
City Project Number:	Engineer / Inspector:
Location:	

Pipe Diameter (inches)	Total Length of Pipe (feet)	Volume of Water (gallons)	Make-up Water Chlorine (ppm)	Chlorine Residual (ppm)	Date and Time	Chlorine Residual after 24 Hours (ppm)	Date and Time

After chlorine residual in the water line has been achieved at a minimum of 25 ppm, all valves and hydrants in the treated section of water line shall be operated during the initial 24 hours to ensure disinfection of the appurtenances.

Diameter (inches)	Volume (1000')
2	163
3	367
4	653
6	1469
8	2611
12	5875

City of Fayetteville

Manhole Vacuum Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____

Drawing Sheet Number	Manhole ID	Manhole Sta. Number	Start Time	Start Pressure (inches of Hg)	End Time	End Pressure (inches of Hg)	Pass or Fail

_____

City of Fayetteville

Sewer Line Low Pressure Air Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____

Plan Sheet Number	Upstream Manhole	Upstream Sta. Number	Downstream Manhole	Downstream Sta. Number	Start Time	Start Pressure (psi)	End Time	End Pressure (psi)	Pass or Fail

City of Fayetteville

Sewer Line Mandrel Test Form

City of Fayetteville

Test Date: _____ Contractor / Superintendent: _____

Project Name: _____

City Project Number: _____ Engineer / Inspector: _____

Location: _____

Plan Sheet Number	Upstream Manhole	Upstream Sta. Number	Downstream Manhole	Downstream Sta. Number	Pass or Fail

City of Fayetteville

CITY OF FAYETTEVILLE, ARKANSAS
POLICY AND PROCEDURE

Subject:	**SEWER SERVICE LINE AND CONNECTION POLICY**
Policy Number:	**OP-01**
Original Policy Date:	**June 23, 1988**
Effective Date of New/Revised Policy:	**August 1, 2005**
Revision Dates:	**July 21, 2005**
Custodian: (Division)	**WATER AND WASTEWATER**
Mayor's Signature and Date	

OP-1.0 PURPOSE:

To establish a uniform policy concerning sewer service connections and sewer service lines.

OP-1.1 POLICY:

General. There have been numerous pipe configurations installed underground since the City of Fayetteville's sewer system was first designed and installed in 1889. This policy is correct and appropriate for over 99% of the situations found. It does not eliminate using sound judgment for the remaining 1% of the cases. Judgment calls shall be the responsibility of the Mayor or his designated representative, who is currently the Water/Sewer Maintenance Superintendent. Grandfather clauses do not apply in cases where public health and safety is compromised, and thus do not apply for sewer issues. Ordinance references are based on the City of Fayetteville Code of Ordinances as in effect on 1 April, 2003.

1. Connection permit required. [Section 51.035, City of Fayetteville Code of Ordinances]. *"No unauthorized person shall uncover, make any connection with or opening into, use, alter, or disturb, any public sewer or appurtenance thereof without first obtaining a written permit from the approving authority. No permit shall be issued to allow any person to tie his property to the sewer system until the connection fee prescribed by Section 51.114 as presently amended or as may be amended in the future is paid."*

2. Separate building sewer provided for every building;, exceptions. [Section 51.039, City of Fayetteville Code of Ordinances]. *"A separate building sewer shall be provided for every building except as follows:*

(A) Where multiple buildings are constructed in an apartment complex or condominium on a single lot or tract of land which cannot be subsequently subdivided and sold in parcels, the individual buildings may be connected to a collector building sewer, provided that only one person is responsible for maintenance of the building sewer.

(B) Temporary buildings, mobile homes, or similar portable structures may be connected to a building sewer installed to serve a previously constructed permanent building, provided that both the permanent and temporary buildings are located on the same lot."

The temporary status is null and void if the structure is in place for more than 365 days. At that time, a separate building sewer must be provided.

Two buildings, or two parts of one building which may have different owners (i.e., townhouses) may not be attached to one 4" or 6" private service line. This has never been legally allowed. If two buildings, or two parts of one building which may have different owners, are attached to a single private service line, this situation must be corrected by the owners and each structure must have a dedicated tap onto the main. The only exceptions are listed above. Multiple structures hooked to one sewer service line are not covered by any grandfather clause, and the situation must be corrected.

Condominiums and other structures which can have separate ownership must each have their own dedicated sewer service line which remains on the same lot/property as the building or portion of the building which it serves.

3. Service Line Crossing Adjacent Lots. Sewer service lines must run directly from the lot which they serve to the main without crossing another lot. The service may cross street right of way and/or the easement to access the main. It may not run parallel to the main, but can run at an angle between 45° to and perpendicular to the main if the main is already installed prior to the development of said land and said service line will be no more than 60' in length within the combined easement/right of way area. Ownership is not the deciding factor; lot lines or parcel lines are the issue. Thus, if one Owner owns two adjacent lots, and builds on one lot, the service for this structure and lot cannot cross the other lot. If the service line would have to be more that 60' in length within the combined easement/right of way area, then the main must be extended so the service line can connect at a 90° angle to the main.

4. Sewer Mains Accessing Every Lot. Sewer mains shall be installed so as to adjoin each lot such that all service lines meet the above requirements. Sewer main extensions are the responsibility of the owner of the lot receiving the service.

5. Sewer Easements for Private Lines. Sewer line easements for private lines to cross adjacent lots are prohibited except in very rare cases. In general, these are when a given

private residence tandem lot, containing only one structure which requires sewer service, is "landlocked" from a sewer main, all adjacent lots have legal access to a main, and the sewer line easement is collocated with an above ground access easement. Private easements shall not be used in cases where sewer main extensions are in the public best interest, such as where a sewer main shall be made accessible to other lots or where a future main may be required.

6. City and Owner Service Line Maintenance and Repair Responsibilities.

There are two general situations which cover sewer service line configurations in the City of Fayetteville. The following two paragraphs explain City and Customer responsibilities for each of these situations.

A. Situation 1, No City Cleanout is Present.

If no City cleanout is present, the Customer owns the service lateral all the way to the main. They are responsible for any and all repairs, clearing any blockages, etc., with the following caveat. If there is a blockage under the paved or concreted portion of the street (from a vertical line drawn at the back of curb to the back of curb, or from the actual edge of the asphalt if no curb is present) which cannot be cleared via rodding or washing, then the City will repair the pipe under the street. If the blockage is determined to be caused by anything which should not be placed in a sewer line (grease, paper towels, toys, croquet balls, cleanout caps, sticks, gravel, kitty litter, or any other materials which are not allowed per the sewer use ordinance) then the Customer will be billed for the work. The burden of proof of the location of the blockage rests on the Customer. The City will meet the Customer or their representative (plumber, rooter, etc.) and try to help them determine the location of the blockage. The City will not place a City owned rod, camera, tape, or other item into the Customer's cleanout or sewer system to determine the location of a blockage- anything placed inside the pipe at this time must belong to or be working for the Customer. If the combined forces determine beyond a reasonable doubt that the blockage is under the street, then we will investigate as necessary to determine what type of repair is necessary. This is the only time we will place City tools inside the Customer's piping system. If there used to be a City cleanout and the cleanout has been removed or damaged, then the situation is the same as when there is no City cleanout present.

If the blockage is outside the area of the paved or concreted portion of the street (from a vertical line drawn at the back of curb to the back of curb, or from the actual edge of the asphalt if no curb is present), then the City grants the property owner who owns the service line the right to perform maintenance on said service line within the easement and/or right of way. This includes work performed on both sides of the road or right of way, to include work performed under a sidewalk.

B. Situation 2, City Cleanout is Present.

A City cleanout is defined as a 4" cleanout located behind the curb or at the easement line (for back yard lines). These cleanouts are typically within 10' of the edge of the roadway or within 10' of the main, respectively. Cleanouts smaller than 4" are never City cleanouts, and are always the responsibility of the property owner.

When a City cleanout is present, the City assumes ownership and responsibility for any blockages between the City cleanout and the main, and which can be cleared by rodding from the City cleanout. If the blockage is determined to be caused by anything which should not be placed in a sewer line (paper towels, toys, croquet balls, cleanout caps, sticks, gravel, kitty litter, or any other materials which are not allowed per the sewer use ordinance) then the owner will be billed for the work. Any blockages prior to the City cleanout shall be the Customer's responsibility. This includes any work to attach to the Customer's side of the tee or wye where the cleanout riser ties to the service lateral.

7. Billing. If a bill is required, the bill will be processed through the accounts receivable process, rather than by being added to the Customer's utility bill. If the bill is not paid or payment terms negotiated within 60 days of first issuance, then the bill will be transferred to the utility bill. Job costs will be based on an actual time and materials basis. Personnel rates will include the full hourly salary costs.

8. Use of old building sewers with new buildings. [Section 51.040, City of Fayetteville Code of Ordinances]. *"Old building sewers, or portions thereof, may be used in connection with new buildings only when they are found on examination and test by the approving authority to meet all requirements of this subchapter."*

Complete remodeling is included in the definition of "new building" if the remainder of the plumbing system is being replaced and must meet current plumbing codes, or if the value of the renovation is equal or grater than 50% of the value of the structure.

The cost of this examination and test is borne by the Owner. Current Environmental Protection Agency regulatory requirements and plumbing codes require that the lines be completely water tight and capable of passing a test with pressurized air. In these cases, a new tap shall be purchased, with the note that the Owner would like to use the existing service lateral. If the latter is determined to be acceptable, then the Owner will be reimbursed the tapping fee less the actual cost of the inspection and testing. It is the owner's responsibility to identify the location of the service lateral.

9. Separation Between Water and Sewer Services. City sewer connections shall be made at least ten feet away from water connections. The sewer service shall have ten (10) feet of separation from the City portion of the water service, measured from the outside of the respective pipes.

10. Service Line Unusual Installation Requirements.

A. Exposed Ditch or Creek Crossings. To protect such service lines from the hazards of water flow, debris damage, freezing, leakage, drainage system maintenance, vandalism, and other factors, sewer service lines which are exposed or which have less than 12 inches of cover where they pass through or under a drainage ditch, creek, swale, intermittent stream, or any other feature whereby they have insufficient cover and/or are exposed shall have special protection in these areas. Sewer service lines in these circumstances shall be installed in a continuous smooth steel encasement across the entire exposed or shallow area. Water tight boots shall be installed on both ends of the steel encasement. Where the line is exposed, the encasement shall be anchored by concrete no less than two feet long along the length of the pipe and surrounding the pipe by six inches in all directions inside the bank. The concrete shall be placed against undisturbed soil in the same fashion as blocking on water lines.

B. Pump Systems. Pump systems are sometimes required in the City of Fayetteville to provide sewer service to facilities which are physically lower than the sewer main which provides them service or in other special cases. Pumps for these type systems shall be grinder or solids handling type pumps specifically designed to handle sanitary sewage, the flow volume, and to pump against the head for the specific circumstance in which the pump is installed. Pumps designed for use with septic systems and for ground water sumps shall not be used for sanitary sewer uses. If physically possible, the service lines that come from these pumps shall flow to a gravity section of service lateral prior to entering the sewer main so as to enter the main with a standard four inch gravity flow service lateral connection.

11. Tapping Procedures.

A. Making Taps. The City will make all taps on existing sewer mains, either by contract supervised by the City or by City crews.

B. The City will provide a wooden stake that is marked “sewer”. Please drive this stake in the ground at your property line where you need the service connection. If this is not done, the connection will not be made. Failure to place the stake promptly could delay your construction process.

C. Write the desired depth of the service connection on the stake in feet and inches. (Note: Due to the depth of the sewer main, conflicts with other existing utilities, and other underground circumstances, it may not be possible at all times to achieve the desired depth, in which case the Owner and/or plumber will be notified by the City personnel). It is the owner’s responsibility to determine if the depth is adequate for the service line. The City will not determine grades on either the service or the mains for purposes of determining whether a structure can tie onto a main using a gravity line.

D. It is safer to wait for the service connection to be installed by the City so that the yard line’s grade can be adjusted accordingly. This will assure that unnecessary

bends will not be needed at the point of connection. Also, the plumber will have the exact depth to work with. The builder and/or plumber are responsible for determining grades and building elevations for service. The grade on the City installed portion of the service line can be affected by a number of factors which cannot be identified prior to installation, to include location and depth of other utilities, etc.

E. The City service connection will terminate at the property line. However, the customer will be responsible for maintenance of that service line from the building to the City main.

F. If the service connection exceeds sixty (60) feet in length (as in a street right-of-way crossing) the property owner will be charged for the excess footage. Prior arrangements must be made for long service connections. All other sewer service connections will consist of one joint of pipe or approximately ten (10) feet. In no case will the line stub out beyond the easement or right-of-way line.

G. If the excavation for the tap exceeds eight (8) feet in depth, the property owner may be charged for excess time required to make the connection. Prior arrangements must be made for deep service connections.

H. Permanently marking the location of the sewer service connection for future reference shall be the responsibility of the property owner. Unless the customer's plumber is on site, the City will backfill their entire excavation, to include the end of the stubbed out pipe, immediately.

I. The stubbed out piece of service pipe (coming from the new tap on the main) will be left plugged when installed. The customer's plumber is required to connect the customer's yard line to this piece of pipe. City crews will not connect the stub out from the tap to the customer's service line.

J. If the City crews have to return to the site to make any adjustments which are necessitated because of the property owner's change of plans, the labor, materials, and equipment will be charged to the owner.

K. A new sewer connection could take as long as four to six weeks or more. All connections are made on a first-come first-served basis, and the demand can fluctuate greatly. Jobs adjacent to or on Arkansas State Highway rights of way require a permit from the Arkansas Highway and Transportation Department, which generally add an additional four weeks. Please allow enough time in your construction plans.

12. Taps Installed When Areas Are Developed. Sewer lines are generally installed when land is developed. Taps, with a section of private service line attached, are generally made for each lot at this time. The City and the lot owner rely on accurate information from the developer, his Engineer, and his contractor as to the location and grade of these taps and service lines.

A. If a tap for a lot is installed when the sewer main is installed, the building on that lot is required to use the tap installed for that lot.

B. If the service line coming off the main cannot be found by the owner or his representatives, then the owner is responsible to buy a tap from the City using the process described in this document. The Water/Sewer Superintendent will then determine if it is optimal to make a new tap or to televise to find the tap that is supposed to be present. If televising is performed and the cost of the televising is less than that of the purchased tap, then the difference between the two costs shall be reimbursed to the owner. If a tap is found by televising, the City will mark the location of the tap (at the main) for the owner. If no tap is found, the cost of the televising will not be added to the tapping fee.

C. If a tap is not in the most desirable location due to slope, building design, etc., then all expenses related to making a different connection shall be paid by the owner. This includes installation of the new tap and proper abandonment of the tap which is not used. The latter involves excavating at the point of connection to the main and removing the connection to the main. The owner shall purchase a new tap paying the normal tap fee, and will pay the actual costs of abandoning the unused connection.

D. Owners are responsible for hooking to the correct tap for that lot, as shown on the developer's as-built plans. If there is a discrepancy between the as-built drawings and the actual installation on the ground, that discrepancy must be resolved between the lot owner and the developer. If an owner inadvertently connects to a tap which is designated for an adjacent lot, then all costs of remediation for all involved lots shall be borne by the owner of the lot which connected to the incorrect tap. No additional taps shall be made until the lot which does not have a connection purchases a tap through the city Engineer's office, using the process described in this document.

13. Taps Prohibited on Transmission Mains Force Mains, and on Sewer Pump Station or Detention Basin Sites. For public health and building safety reasons, individual user or structure sewer taps shall not be made on transmission mains, defined as any sewer main 15" and larger, or any pressurized force mains. Dead end main line extensions off of transmission mains shall only be approved on a case by case basis, and may be rejected. Individual user sewer taps shall not be made on sewer pump station or detention basin sites. Taps for lots adjacent to these sites shall only be made on the collection (as opposed to transmission) mains outside these sites.

14. Control of Extraneous/Illegal Flows. It violates federal, state and local regulations to have any extraneous flows in the sewer system. These flows include but are not limited to rain water, ground water, sump pump water, water from area drains exposed to outside weather (including external stairwell drains, loading docks, etc.), defective pipe joints, defective cleanouts, cellar drains, catch basins, foundation drains, yard drains, and roof down spouts. These flows must be routed to the storm water system, and cannot be routed to the sewer system. Owners are responsible for maintaining their portion of the sewer system in such a way that these flows are prevented from entering the sewer system.

A. Cleanout caps must be properly installed and must meet current plumbing codes. Caps shall not be removed to allow extraneous flows (ponded yard water, etc.) into the sanitary sewer system.

B. If caps are removed such that they allow extraneous flows to enter the sewer system, the City shall replace the cap at the owner's expense.

C. If the cap is removed after the first time the City replaces the cap, then a riser will be installed in the cleanout so that extraneous flows cannot enter the sewer system through the cleanout. All associated work will be billed to the owner.

15. Grease Control. Grease is a significant problem in our sewer system. Many people assume that running grease down the drain is okay, as long as they use plenty of hot water. Unfortunately, the hot water cools in the pipes, and the grease coagulates further down the line. Sometimes people assume that putting grease in the line through the garbage disposal or with cleansers is acceptable. These do not prevent the grease from coagulating in the pipes. No amounts of grease, cooking oil, animal fat grease or byproducts, cooking fats or solid animal fat or meat products can be put down any part of the sewer system. These materials should be disposed of in the trash. Grease covered pans or dishes should be wiped down first with a paper towel or rag, which should then be disposed of in the trash.

16. Items Which Are Allowed To Go Down the Sewer.

A. Water from showers, bath tubs, dishwashers, laundry facilities, sinks and non-basement floor drains.

B. Body wastes from toilets.

C. Toilet paper.

D. Household chemicals that are specifically designated for use in sinks, showers, and toilets.

17. Items Which Are Not Allowed To Go Down the Sewer. The following cannot be placed in a sewer system under any circumstances. Repair costs incurred due to a blockage caused by any of these items being placed in a sewer line, either intentionally or unintentionally, will be billed to the customer who owns or resides in the building to which the sewer line provides service.

A. Grease of any type, to include cooking oil, cooking grease, cooked animal fats, etc. Grease should be handled as specified above.

B. Meat, meat by products, animal fats.

C. Paper towels.

D. Feminine Hygiene Products, including those that claim to be "flushable."

E. Any items greater than ½" in any measured dimension except body wastes and toilet tissue.

F. Chewing gum.

G. Household chemicals other than those specifically designated for use in sinks, showers, and toilets.

H. Baby wipes and other similar wipes, including those that claim to be "flushable."

I. Kitty litter.

J. Animal wastes.

K. Diapers.

L. Foreign materials such as toys, sticks, cleanout caps, gravel, etc.

M. Air conditioner condensate.

N. Uncontaminated cooling water from cooling towers. If said water is too hot to be discharged into the storm drain, the owner is responsible to hold the water until it cools enough to be discharged into the storm drain. Cooling tower water which is treated, and is thus contaminated, shall be discharged to the sanitary sewer.

O. Clean or uncontaminated natural water to include but are not limited to rain water, ground water, sump pump water, water from area drains exposed to outside weather (including external stairwell drains, loading docks, etc.), defective pipe joints, defective cleanouts, cellar drains, catch basins, foundation drains, yard drains, and roof down spouts. These flows must be routed to the storm water system, and cannot be routed to the sewer system. Owners are responsible for maintaining their portion of the sewer system in such a way that these flows are prevented from entering the sewer system.

P. Automobile or engine mechanical lubricant liquids, semi-liquid materials or solids.

Q. Wastewater having a pH less than 5.0 or more thean 12.5, or otherwise causing corrosive structural damage to the wastewater collection system, the wastewater plant or equipment.

R. Wastewater having a temperature greater than 150 degrees Fahrenheit (65^{o} C).

S. Pollutants which create a fire or explosive hazard, to include but not limited to liquids with a closed-cup flashpoint of less than 140 degrees Fahrenheit (60^{o} C).

T. Pollutants which result in the presence of toxic gasses, vapors, or fumes within the collection system or wastewater treatment plant which may cause the potential for acute worker health and safety problems.

U. Wastewater which imparts color which cannot be removed by the treatment process, to include but not limited to dye, wastes and vegetable tanning solutions which consequently impart color to the treatment plant's effluent.

V. Any radioactive wastes or isotopes except in compliance with applicable federal or state regulations and approved by the City.

W. Medical wastes.

18. Access to Easements. The City of Fayetteville is required by federal law to properly operate and maintain its utilities. Doing this requires periodic work on said utility system to include but not limited to clearing easements, adjusting manholes to grade, inspecting manholes and cleanouts, installing and inspecting marking signs, locating lines, testing lines with dye and smoke, televising lines, washing lines, and more. In order to do this work, City employees and contractors working for the City are required by law to access the pipe. This often requires crossing private property to get to our easement. By having

an easement on a lot, these workers are granted the legal right to cross said lot to get to the utility easement. Lots containing an easement shall have a double wide gate installed to allow vehicular access to the main.

CITY OF FAYETTEVILLE, ARKANSAS
POLICY AND PROCEDURE

Subject:	**WATER SERVICE LINE AND CONNECTION POLICY**
Policy Number:	**OP-02**
Original Policy Date:	**June 23, 1988**
Effective Date of New/Revised Policy:	**August 1, 2005**
Revision Dates:	**July 21, 2005**
Custodian: (Division)	**WATER AND WASTEWATER**
Mayor's Signature and Date	

OP-2.0 PURPOSE:

To establish a uniform policy concerning water service lines and water service connections.

OP-2.1 POLICY

General. There have been numerous pipe configurations installed underground since the City of Fayetteville's water system was first designed and installed in 1889. This policy is correct and appropriate for over 99% of the situations found. It does not eliminate using sound judgment for the remaining 1% of the cases. Judgment calls shall be the responsibility of the Mayor or his designated representative, who is currently the Water/Sewer Maintenance Superintendent. Grandfather clauses do not apply in cases where public health and safety is compromised, and thus do not apply for water system issues.

1. Tapping Procedures.

A. Making Taps. The City will make or supervise all taps on existing water mains, either by City crews making the tap or by contract supervised by the City Engineering inspectors.

B. When the tap is purchased, the City will provide a wooden stake that is marked "water" and with the size of the connection to be made. Please drive this stake in the ground on the City side of your property line where the center of the meter box is to

be located. If this is not done, the connection will not be made. Failure to place the stake promptly could delay your construction process.

C. Double water service connections should be placed at the common property line for the two addresses being served, when applicable.

D. The meter box will be installed at the existing grade unless otherwise specified. If special instructions are necessary, please make an appointment with a Water and Sewer Division service representative and give instructions at that time. Making a special note and attaching it to the tap paperwork when the tap is purchased will reduce potential delays for special requirements. The owner is responsible for knowing the final grade, as required by the owner's work or ordinances which govern the grade for sidewalks and trails, and areas parallel to streets, drainage ways, etc.

E. Meter boxes are generally located on the City side of the property line (edge of easement and/or right of way). If you have a special situation, consult with a Water/Sewer Department service representative. Deviations are only approved on a case-by-case basis, and may not be approved. If the Water/Sewer Department feels the meter box needs to be located at a different location other than where staked, a field representative will contact the individual who purchased the tap.

F. When locating your meter box, please avoid the following: driveways, sidewalks, parking lots, enclosed areas, drainage ditches, flower beds, and low areas where water stands. Meters shall not be installed in or allowed to remain in driveways or areas where meter readers cannot easily get to the meter box to read the meter. They will not be installed in locations where the meter box will regularly be filled with ground water, nor in places where it is difficult for a meter reader to get to the meter to read it. When driveways are constructed or created with either gravel, asphalt, concrete, or any other similar material, existing water meters shall be moved out of the driveway area at the owner's expense.

G. The connection to the customer's side of the meter is done by the customer's plumber after the meter loop and box is in place. The plumber will tie the yard line to the service pipe that is stubbed out of the meter box, City crews will not make this connection. Pressure regulators shall be installed no closer than 5 feet from the water meter box.

H. Connections are made on a first come first served basis, and could take three to six weeks or more to be installed, depending on workload. In cases of connections in or adjacent to Arkansas State Highways or railroads, a permit must first be obtained which often takes up to an additional six weeks. This will greatly lengthen the tap process.

I. City water connections shall be made at least ten (10) feet away from sewer connections. The City portion of the water service shall have ten (10) feet of separation from the sewer service, measured from the outside of the respective pipes.

J. Connections shall not be made in circumstances where they will degrade the operating pressure or flow available to existing domestic or building water meters. In these cases, the owners requiring the connection shall be responsible for increasing the capacity on the City's water distribution system such that the required capacity is available.

2. Water Meter Adjustments. If City crews have to return to the site to make any adjustments on the meter box which are necessitated because of the property owner's change of plans, such as landscaping, driveway location, grade, etc., all labor, materials and equipment costs shall be charged to the owner. This also applies to meters which are installed by a developer when a development is first constructed and to preexisting meters.

3. Service Line Depth. A water service line must have at least 24" of ground cover to prevent freezing. If the grade is changed such that the service line does not have sufficient cover, the service line must be lowered so that it does have sufficient cover. The labor, materials and equipment costs will be charged to the owner.

4. Access to and Visibility of Water Meters.

A. Brush, landscaping or other items which cause the meter box to be difficult to see from the right-of-way or easement, or which causes difficulty for meter readers to get to the box, shall be removed at the owner's expense. This includes plants, decorative landscaping, retaining walls, private side walks, stairs, decks, large decorative rocks, concrete statues, and other similar items. These shall not be placed over the City's portion of the service line or within two feet of the box on the customer's side of the box, three feet of the box parallel to the edge of the right of way or easement, or at all on the City's side of the right of way or easement.

B. Meters shall be accessible without going through fences or gates except in special circumstances.

C. Meters shall be placed on the City side of any private retaining walls of any type, including those constructed immediately beside the sidewalk. The City portion of the service line shall not go under any type of private wall or other structure.

5. Owner Responsibility. The owner is responsible for the service line from the outside edge of the meter box to the home. This includes the point where the plumber hooks up to the tail piece which comes out of the meter loop, and any pressure regulator or other hardware installed on the owner's side of the meter box.

6. Irrigation Taps. The City reserves the right to refuse to make irrigation taps, if said tap has the potential to degrade the operating pressure or flow available to domestic or building water meters. In general, irrigation taps shall not be made on mains which are 3" or smaller. Irrigation meters and irrigation systems shall not be installed on double

meters servicing another residence, as this can degrade the other residence's water pressure. The City must maintain positive control over the amount of flow on marginal irrigation installations, The City shall not rely on verbal or written commitments from the owner, as owners change and companies and individuals operating and maintaining irrigation systems can not be reasonably expected to pass information regarding agreed upon flow restrictions through the life of the irrigation system. Flow tests shall not be used to change this policy, as the water line flow will gradually degrade with time and with peak usage, and the flow test represents only the best case situation.

7. Two Inch Taps. Two inch taps shall not be made on any mains 3" or smaller. If a customer requires a two inch (2") tap and if said tap has the potential to degrade the operating pressure or flow available to other domestic or business meters, then the customer, at his expense, shall be responsible to reinforce the water distribution system such that the point demand from the two inch meter shall not degrade the operating pressure or flow available to other domestic or business meters.

8. Sewer Service Required. Water services can not be installed until after the lot has legal, approved and installed access to public sewer or an a septic system approved by the Arkansas Department of Health.

9. Relocating Existing Meters. Meters are typically located on the City side of the easement or right of way. In the past, some meter boxes were placed further in the property than the easement or right of way. These meters shall be moved to the property line at such time as the City side of the meter loop needs work or needs to be replaced. The existing yard line will remain in service as long as it meets the current plumbing codes and has had no documented problems. The new meter location will conform to this policy. Meters shall be placed on the City side of any private retaining walls of any type, including those constructed immediately beside the sidewalk. The City portion of the service line shall not go under any type of private wall, sign, or other structure. Meters shall not be allowed to remain in a driveway.

10. Site Restoration. In the event maintenance work is required on a service line, meter, or meter box, the site restoration will match that done for main line repairs. The utility shall repair only the following in an easement area or within two feet of the meter box: grass, asphalt, normal (standard) concrete, irrigation systems which are damaged, mail boxes which are damaged, and/or private wiring (such as for on-premises lighting, etc.) which is damaged. The City shall not pay for relocation, repair, or damage caused to any landscaping, unusual concrete, plants, planters, playground equipment, decorative rock, rip rap, and other items placed on the easement or within two feet of the meter box. The latter items can be removed by the City, at the owner's expense, if their movement is required to make a repair.

11. Water Service Line Location.

A. Crossing Public Easements or Rights of Way. The customer's portion of a water service line shall not be installed in a public easement or right of way, except for the last two feet required to access the meter box.

B. Service Line Crossing Adjacent Lots. Water service lines must run directly from the lot which they serve to the main without crossing another lot. The service may cross street right of way and/or the easement to access the main. It may not run parallel to the main, but can run at an angle between 45° to and perpendicular to the main. Ownership is not the deciding factor; lot lines and separate property parcels are the deciding factor. Thus, if one owner owns two adjacent lots, and builds on one lot, the service for this structure and lot cannot cross the other lot.

12. Water Mains Accessing Every Lot. Water distribution mains shall be installed so as to adjoin each lot such that all service lines meet the above requirements. Installing and paying for water main extensions is the responsibility of the owner of the lot receiving the service.

13. More Than One Water Main Available. In cases where more than one water main is available to a given lot, the City reserves the right to decide which main may be used to provide service to that lot. This is required in cases where some mains are on different pressure planes, where some lines have a longer life expectancy than others, etc.

14. Water Easements for Private Lines. Water line easements for private lines to cross adjacent lots are prohibited except in very rare cases. In general, these are when a given for private residence tandem lot containing only one structure which requires water service, wherein the lot is "landlocked" from a water main, all adjacent lots have legal access to a main, and the water line easement is collocated with an above ground access easement. Private easements shall not be used in cases where water main extensions are in the public best interest, such as where a water line shall be made accessible to other lots, where a future main may be required, where a water main loop is desirable to provide better public service, or where fire protection is required.

15. Use of old building water service lines with new or renovated buildings. Old building water service lines may be used in connection with new buildings only when they are found on examination and test by the approving authority to meet all current plumbing requirements.

Complete remodeling is included in the definition of "new building" if the remainder of the plumbing system is being replaced and must meet current plumbing codes, or if the value of the renovation is equal or grater than 50% of the value of the structure.

The cost of this examination and test is borne by the Owner. In these cases, a new tap should be purchased, with a note that the Owner would like to use the existing service line. If the latter is determined to be acceptable, then the Owner will be reimbursed the

tapping fee less the actual cost of the inspection and testing. It is the owner's responsibility to identify the location of the service line.

16. Taps Prohibited on Transmission Mains and on Water Tank or Pump Station Sites. Individual user water taps shall not be made on transmission mains, defined as any water main 16" and larger. Main line extensions off of transmission mains shall only be approved on a case by case basis, and may be rejected. Individual user water taps shall not be made on water tank or pump station sites. Taps for lots adjacent to these sites shall only be made on the distribution (as opposed to transmission) mains outside these sites.

17. Water Pressure Provided.

A. The City shall provide normal operating water pressure of at least 25 pounds per square inch (psi) at the City's side of the meter loop. The City does not guarantee this water pressure at all times, as the pressure will occasionally be lowered or the mains may have to be turned off for scheduled and unscheduled maintenance. It is possible that some customers at some locations shall need a pump on their side of the meter to provide the pressure desire for their water use. These pump systems cannot have such capacity that they reduce pressure on the City's main such that degrade the operating pressure or flow available to existing customers.

B. Taps shall not be made for locations where there is not a reasonable expectation of the City being able to provide 25 psi operating pressure at the City's side of the meter under summer high flow operating conditions.

C. The water pressure at the City's side of the meter may exceed that for which domestic plumbing is designed. If the pressure at the City's side of the meter exceeds 70 psi, the owner is required to install a pressure regulator on his system on his side of the meter. The pressure regulator is the owner's property and responsibility.

18. Access to Easements. The City of Fayetteville is required by federal law to properly operate and maintain its utilities. Doing this requires periodic work on said utility system to include but not limited to clearing easements, checking valve boxes, raising, exercising and operating valves, installing and inspecting marking signs, locating lines and more. In order to do this work, City employees and contractors working for the City are required by law to access the pipe. This often requires crossing private property to get to our easement. By having an easement on a lot, these workers are granted the legal right to cross said lot to get to the utility easement. Lots containing an easement shall have a gate installed to allow vehicular access to the main.

SECTION 33 4000
STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2014.

B. AASHTO M 294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500 MM (12- to 60-in.) Diameter; 2013.

C. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

1.02 WORK INCLUDED

A. Pipe culverts.

B. Concrete curb inlet structures and junction boxes.

C. Connection to existing concrete drainage structures.

D. Pipe material noted on plans may not be substituted by any other material.

1.03 RELATED WORK

A. Section 31 2000 – Earth Moving

B. Section 32 0523 – Cement and Concrete for Exterior Improvements.

C. Section 32 1613 – Concrete Curb and Gutters.

D. Section 33 0516 – Manhole and Structures.

1.04 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 PIPE CULVERTS

A. Reinforced Concrete Pipe (RCP): ASTM C76-78, Class III.
   1. Material: Concrete and reinforcing steel.
   2. Shape: Circular.
   3. Sizes: As shown on Drawings.

B. Joint Material:
   1. Cold-applied preformed plastic gasket type sealant conforming to Federal Specification SS-5-00210.
      a. Primer: As specified by the manufacturer.

C. Polymer Coated Corrugated smooth interior Steel Pipe (CMP): AASHTO M 36 and AASHTO M218:
   1. Material: Steel (polymeric pre-coated galvanized type B 10mil both sides).
   2. Type: Corrugated w / ¾" x ¾" x 7½ " external ribs in accordance w/ ASTM A760.
   3. Sizes: As shown on Drawings.

D. Corrugated Polyethylene Pipe (CPEP): AASHTO M 294 or ASTM F 2648 for LEED Projects.
   1. Material: Virgin Polyethylene compounds, uniformly pigmented, with no cracks or creases. The pipe shall have a minimum pipe stiffness at five percent deflection as follows when tested in accordance with M 294 or F 2648:
      a. Diameter (in) Pipe Stiffness (psi)
         1) 12 45
         2) 15 42

3) 18 40
4) 24 34
5) 30 28
6) 36 22

2. Type: “S” – Full circular cross-section with an outer corrugated wall and a smooth inner wall.
   a. Sizes: As shown on drawings.

E. Couplings for CPEP
   a. Couplings shall be corrugated to match the pipe corrugations and shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Couplings shall be bell and spigot, split collar, or screw–on collar.
      1) PIPE AND VALVES FOR FUEL CONTAINMENT

F. Pipe used for fuel containment when shown on plan:
   1. Ductile Iron Pipe.

G. Valves for fuel containment when shown on plan:
   1. See Section 33 1219
      a. shall contain “Buna N” NBR (nitrile butyl rubber)
         1) CURB INLET STRUCTURE AND JUNCTION BOX

H. Concrete and reinforcing steel:
   1. Refer to Standard Detail.
      a. Refer to Section 32 0523 and ACI 301.

I. Manhole rings and covers: ASTM A48, Class 30A, Type II Traffic safe.
   1. Material: Cast Iron, solid cover.
   2. Size 24-inch diameter with ring depth equal to concrete thickness.
      a. BEDDING AND BACKFILL MATERIALS

J. Select Backfill Materials: soil excavated from trench or sub-soil from site that is free of rocks larger than 1-1 ½ inches in greatest dimension, and free from frozen soil, large clumps of soil, muddy soil, organic matter and foreign materials.

K. Class I Bedding Material: Angular, graded stone, ¼ inch to 1½ inch size.

PART 3 EXECUTION

3.01 CONCRETE PIPE CULVERT INSTALLATION

A. Excavate and backfill the trench in accordance with the provision of Section 33 05 16

B. Grade the bottom of the trench to provide a firm bedding surface of uniform density along the entire length of the pipe.

C. Shape the bottom of the trench to conform to the bottom one quarter of the outside diameter of the circular pipe.

D. Lay the pipe beginning at the downstream end with the groove end of the pipe placed facing upstream.

E. Join pipe using specified cold applied preformed plastic joint sealant. Clean the pipe joint surface and prime, if recommended by the manufacture, brush on and allow to dry. Remove protective wrapping from one side of the rope. Lay rope strip side up on the surface of the pipe joint and press the strip firmly to surface of pipe joint end-to-end continuing around the entire circumference of the joint. Remove the remaining protective wrapping and force pipe into connection until material fills the joint space.

F. To insure an even and well-filled joint, accomplish the final joining of the pipe by either pushing or pulling by mechanical means each joint of the pipe as it is laid.

G. In cold weather, either warm the joint material in a hot water bath, or by other approved methods, to the extent required to keep the material pliable for placement without breaking or cracking, or use butyl rubber type joint sealant.

H. In areas not under pavement of structure “Slice-in” the bedding material under the haunches of the pipe with and then hand tamp or mechanical tamp the backfill up to the horizontal centerline of the pipe.

I. Under pavement and structures, compact the backfill on the sides of the pipe to the required densities specified in Section 31 2000 using mechanical tamps with the top 12 inches of subgrade compacted to 95% of the soils Modified Proctor maximum dry density at or near the optimum moisture content.

a. CORRUGATED POLYETHLENE PIPE CULVERT INSTALLATION

J. Excavate subsoil to depth and grade line as required for proper installation of the culvert pipe. Keep trench as narrow as possible but sufficiently wide to permit tamping under the haunches and installation of connecting band when sections are joined. Keep sidewalls as vertical as possible, at least to an elevation above the top of the pipe.

K. Grade bottom of trench to provide a firm bedding surface of uniform density along the entire length of the pipe. Remove rock or soft, unstable material encountered at the excavated grade line to a minimum depth of 6 inches and replace with Class I bedding material.

L. Shape bottom of trench to conform to bottom one quarter of the outside diameter of the circular pipe and up to the widest part of arch pipe, allowing a uniform blanket of loose material to cover the shaped bedding to a depth sufficient to allow the corrugations to be filled with the material.

M. Place corrugated metal pipe on bedding with longitudinal laps or seems, if any, at the sides. To assemble sections of pipe, place corrugated connecting band around or under the first pipe, then lay the second pipe section with the corrugations matching and the adjacent ends butting together. Keep dirt and gravel out of joint so that corrugations fit snugly. Fasten bolts on band tightly and uniformly.

N. Place backfill material in 4 inch layer haunches alternately on both sides of pipe, using Class I bedding material. Slice-in with a shovel under the haunches to eliminate voids. Using select backfill material, place material in 6 inch lifts alternately on each side of pipe up to widest part at arch pipe, and using hand tamps or mechanical tampers, compact each lift to a minimum of 90% of optimum density for the material as determined by Modified Proctor procedures, ASTM D1557. If Class I bedding material is used, place the material in such manner as to eliminate voids and consolidate and interlock the material to form a stable side support for the pipe.

O. In locations not in traffic areas, hand place select backfill to a level 12 inches above the top of the pipe in such manner as to minimize voids, unless otherwise noted on the plans. Backfill up to surrounding ground surface or finished subgrade with subsoil containing no rocks or boulders large thank 6 inches in greatest dimension within 12 inches of the subgrade. Leave top of backfill slightly mounded to allow for settlement.

P. Under traffic areas, backfill trench from horizontal centerline of pipe up to top of subgrade using either select backfill material or Class I bedding material. If select backfill material is used, place material in 6 inch lifts and compact with mechanical tamps. Compact each layer to within 24 inches of subgrade to 90% of optimum density for the material as determined by Modified Proctor procedures, ASTM D1557. Compact the remaining 24 inches to subgrade to 95% of optimum density using the same procedures. If Class I bedding material is used, place the material in such manner as to minimize voids and interlock the material to form a stable fill that will support the pavement structure and subsequent traffic loads.

Q. Patch cut edges and surface-damaged areas with specified patching material to restore protection to metal surface originally provided by polymer coating.

a. CONCRETE STRUCTURES INSTALLATION

R. Forming concrete, placing reinforcing steel and placing and curing concrete: Refer to Section 32 05 23 and ACI 301.

S. Excavation and Backfill: Refer to Section 33 0516.

a. EXISTING STRUCTURE MODIFICATION

T. Remove top and throat of existing curb inlet.

U. Remove loose and damaged concrete material.
V. Dispose of removed material including cast iron ring and cover.
W. Cut and tie reinforcing steel to new steel as detailed on Drawings.
X. Form new top and provide new cast iron ring and cover.
Y. Place steel as detailed on Drawings and place concrete to modify structure into a junction box.
Z. Patch inside face of wall to achieve smooth surface.

END OF SECTION