Specifications

MECHANICAL RENOVATIONS FOR:
CRAIGHEAD COUNTY COURTHOUSE
Jonesboro, Arkansas

Commission No. 2309D

BRACKETT
KRENNERICH
architects

100 East Huntington, Suite D
Post Office Box 1655
Jonesboro, Arkansas 72403-1655
(870) 932-0571

SECTION 00 0101

PROJECT TITLE

MECHANICAL RENOVATIONS FOR: CRAIGHEAD COUNTY COURTHOUSE JONESBORO, ARKANSAS

OWNER:
CRAIGHEAD COUNTY, ARKANSAS
CRAIGHEAD COUNTY ANNEX
511 UNION, ROOM 119
JONESBORO, ARKANSAS 72401

OWNER'S REPRESENTATIVE:
MARVIN DAY, COUNTY JUDGE
(870) 933-4500

ARCHITECT:
BRACKETT KRENNERICH ARCHITECTS
100 E. HUNTINGTON, SUITE D
POST OFFICE BOX 1655
JONESBORO, ARKANSAS 72403-1655
(870) 932-0571

CONSULTING ENGINEERS:

MECHANICAL/PLUMBING/ELECTRICAL ENGINEER
PETTIT & PETTIT CONSULTING ENGINEERS, INC.
201 E. MARKHAM SUITE #400
LITTLE ROCK, AR 72201

STRUCTURAL ENGINEER
ENGINEERING CONSULTANTS, INC.
401 WEST CAPITAL AVE., SUITE 305
LITTLE ROCK, AR 72201

COMMISSION NUMBER: 2309D

PROJECT DOCUMENTS DATE: November 11, 2024

00 0110

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SECTION 00 0115

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ADDENDUM NO. 1

PROJECT TITLE:	Mechanical Renovations for: Craighead County Courthouse Jonesboro, Arkansas
OWNER:	Craighead County, Arkansas Craighead County Annex 511 Union, Room 119 Jonesboro, AR 72401
OWNER'S REPRESENTATIVE:	Marvin Day, County Judge (870) 933-4500 Office
ARCHITECT:	Brackett-Krennerich and Associates P.A. 100 East Huntington Avenue, Suite D Post Office Box 1655 Jonesboro, Arkansas 72403-1655 (870) 932-0571 *office*
COMMISSION NUMBER:	2309D
DATE OF ISSUE:	November 11, 2024
BID DATE/LOCATION:	**November 26, 2024** at **2:00 p.m.** C.D.S.T Room 119 511 Union Street Jonesboro, AR 72401

Contractor shall take note of the following listed revisions and/or additions to the drawings and specifications for the above referenced project and adjust the contract sum accordingly. These revisions are hereby made a part of said documents and subsequent construction as if therein included.

GENERAL

1. General: Pre-Bid meeting has been rescheduled to:

November 18, 2024 at **2:00 p.m.** C.D.S.T
Room 119
511 Union Street
Jonesboro, AR 72401

SECTION 00 1113

ADVERTISEMENT FOR BIDS

Qualified Contractors are invited to bid on a contract for **"Mechanical Renovations for: Craighead County Courthouse, Jonesboro, Arkansas".** The bids shall be on a lump sum basis.

Craighead County, hereinafter termed owner, will receive bids until **2:00 p.m., Tuesday, November 26, 2024.** Bids may be mailed or delivered in care of Marvin Day, County Judge of Craighead County, 511 Union, Room 119, Jonesboro, Arkansas 72401. Bids received after this time will not be accepted.

Bids will be publicly opened and read aloud at the stated time in the County Judge's office.

Project consists of mechanical upgrades and renovations to the existing 27,000 SF Craighead County Courthouse. Project includes a new outside air package unit and associated ductwork. Change out of existing heat pumps and associated work. Additional work consists of new electrical transformer, and minor structural modifications, and interior modifications to accommodate mechanical systems.

Plans, specifications, bid forms, and other contract documents may be examined at the office of the architect. The official version of the complete set of the contract documents should be examined and are obtainable from:

Jonesboro Blueprint
222 Madison Street
Jonesboro, AR 72401
(870) 932-4349

Southern Reprographics
901 W. 7th Street
Little Rock, AR 72201
(501) 372-4011

Obtaining contract documents through any source other than the Design Professional or their representative(s) is not advisable due to the risks of receiving incomplete or inaccurate information. Contract documents obtained through the Design Professional or their representative(s) are considered the official version and take precedence should any discrepancies occur. General contractors may obtain two (2) complete sets of bidding documents upon deposit of **$150.00 per set, payable to Brackett-Krennerich & Associates, P.A.** which is refundable, less postage/shipping costs, if applicable, to bona fide bidders upon return of documents in good condition within 10 days after bid date.

Additional sets of documents may be obtained for use by subcontractors and material suppliers upon receipt of **$75.00** per set which is refundable less cost of reproduction **(50% refundable)**, and less postage/shipping costs if applicable, upon return of documents in good condition within 10 days after the bid date. No partial sets will be issued.

Bid Security in the amount of five percent (5%) of the bid must accompany each bid in accordance with the Instructions to Bidders.

Craighead County encourages all small, minority, and women business enterprises submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

There will be a **Pre-Bid Conference** held at the site on **Tuesday, November 12, 2024.** The conference will start at exactly **2:00 p.m.** Prime contractors who arrive late or fail to attend this meeting may forfeit their bidding privilege. The owner reserves the right to waive this requirement and/or schedule additional meetings.

The owner reserves the right to reject any and all bids, or to waive any formalities.

Marvin Day, County Judge
Craighead County, Arkansas

SECTION 00 2100
INSTRUCTIONS TO BIDDERS

1.01 RECEIPT AND OPENING OF BIDS

A. Owner: Craighead County, Arkansas

B. Bid Location: **Craighead County Judge's Office, 511 Union, Room 119, Jonesboro, AR 72401**

C. Bid Date/Time: **Tuesday, November 26, 2024 at 2:00 p.m.**

D. The owner reserves the right to reject any or all bids and to waive formalities.

E. The owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities.

F. Owner assumes no obligations to accept the lowest bid or any bid withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof.

G. Any bid received after the time and date specified shall not be considered.

H. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

1.02 PREPARATION OF BID

A. Each bid must be submitted on the prescribed forms.

B. All blank spaces for bid prices must be filled, in ink or typewritten.

C. Bids must be signed in ink showing title or authority to bind bidder to a contract.

D. Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, the name of the project and the contractor's license number as issued and approved by Arkansas State Licensing Board previous to bid date. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope as specified in the bid form.

1.03 PROPRIETARY INFORMATION

A. All information submitted in response to this bid is public after the bid opening. The bidder should not include as a part of the response to the invitation to bid any information which the bidder believes to be a trade secret or otherwise privileged or confidential. If the bidder wishes to include such material with a bid, then the material should be supplied under separate cover and identified as confidential. The Owner does not warrant or agree to, but will endeavor to keep that information confidential. Contractor acknowledges that information in the possession of the City of Jonesboro may be subject to the provisions of the Arkansas Freedom of Information Act.

1.04 SEVERABILITY

A. The finding or determination of any part or parts of the general instructions, terms and conditions is void, unenforceable, invalid or voidable shall result in only that part being stricken with the remainder to continue in full force and effect.

1.05 BIDDING DOCUMENTS

A. Bidders may obtain complete sets of Contract Documents from the designated planroom.

B. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

C. Obtaining Contract Documents through any source other than the planroomt is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information.

D. The documents obtained through the planroom are considered the official version and take precedence if any discrepancies occur.

E. The fact that documents used for bidding purposes are named "Contract Documents" does not diminish in any way the right of the owner to reject any and all bids and to waive any formality.

1.06 QUALIFICATION OF BIDDER

A. The owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the owner all such information and date of same for this purpose as the owner may request.

B. The owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

C. Conditional bids will not be accepted.

D. All bidders shall comply with the requirements of the Contractor's Licensing Law of the State of Arkansas, Arkansas Code Annotated § 17-25-101 et seq.
   1. **Note: All contractors must be licensed the day the project bids.**

E. The company may be required, upon request, to prove to the satisfaction of the owner that they have the skill, experience, and the necessary facilities and financial resources to perform the contract in a satisfactory manner and within the required time.

1.07 ASSIGNMENTS

A. Neither this contract nor any interest therein nor claim thereunder may or shall be assigned or transferred by the contractor except as expressly authorized in writing by the Owner.

B. No contractor, subcontractor or agreement shall be made by the contractor with any other party for furnishing any of the product, work or services herein contracted without the written approval of the Owner.

1.08 CONFLICT OF INTEREST

A. By submitting a bid, the contractor represents and warrants that no employee of the Owner is in any manner interested directly or indirectly in the bid or contract which may result from the bid or in any of the expected profits which might arise therefrom; further, that no attempt has been made to influence or gain favorable advantage by communicating directly or indirectly with any official of the Owner.

B. It is understood that any action taken which might tend to degrade the integrity of the competitive bidding process will be considered as grounds for disqualification or a breach of this contract.

1.09 NON-COLLUSIVE AFFIDAVIT

A. By submitting a bid, the company and the individual personally signing the bid represent and warrant that such bid is genuine and is neither collusive or made for or on behalf of any person not named, and that he has neither induced or solicited any other company to place a sham bid nor directly or indirectly caused another company to refrain from or be unable to present a bid.

1.10 BID SECURITY

A. Each bid proposal shall include with it a bid security in the amount of 5% of the total bid offered.

B. The bidder will be required to submit a bidder's deposit which includes enclosing a cashier's check payable to the order of the owner drawn upon and certified by a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to 5% of the bid.

C. Such bid bonds will be returned to all except the three lowest bidders within three days after the opening of the bids, and the remaining bid bonds will be returned promptly after the owner and the accepted bidder have executed the contract, or if no bids were accepted, upon demand of the bidder at the time specified, so long as he has not been notified of the acceptance of his bid.

1.11 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

A. The successful bidder, upon his/her failure to execute the contract and bonds required within ten (10) days after he has received notice of the acceptance of his bid, shall forfeit to the owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

1.12 TIME OF COMPLETION / LIQUIDATED DAMAGES

A. Bidder must agree to commence work within ten (10) days of the date of the "Notice to Proceed" of the owner and to fully complete the project. **All punch list items to be completed within 150 days.**

B. The contractor will proceed with the work at such rate of progress to insure full completion within the contract time. It is expressly understood and agreed, by and between the contractor and the owner, that the contract time for completion of the work described in the contract is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

C. If the contractor shall fail to complete the work within the contract time, of extension of time granted by the owner, then the contractor will pay to the owner the amount of **Three Hundred Dollars ($300.00)** for liquidated damages for each calendar day that the contractor shall be in default after the time stipulated in the contract documents for each phase of the work.

D. Time extensions will be granted to the contractor only when the delay in completion of the work is due to the following and the contractor has promptly given written notice of such delay to the owner or architect.
   1. To any preference, priority or allocation order duly issued by the owner.
   2. To unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God, or the public enemy, acts of the owner, acts of another contractor in the performance of a contract with the owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and
   3. To any delays of subcontractors occasioned by any of the causes specified in 1. and 2. above.

1.13 CONDITIONS OF WORK/EXAMINATION OF SITE OF WORK

A. Each bidder must inform himself/herself fully of the conditions relating to the construction of the project and the employment of labor therein.

B. Bidder shall examine the Contract Documents and visit the project site of work.

C. Bidder shall become familiar with all existing conditions and limitations under which the work is to be performed, and shall base bid on items necessary to perform the work as set forth in the contract documents.

D. No allowance will be made to Bidder because of lack of such examination or knowledge.

E. The submission of a bid shall be construed as conclusive evidence that the Bidder has made such examination.

1.14 PRE-BID CONFERENCE

A. A Pre-Bid Conference is to be held **on site on Monday, November 18, 2024.**

B. The meeting will begin precisely at **2:00 p.m.**

C. Prime contractors who arrive late or fail to attend this meeting may forfeit their bidding privilege.

D. The owner reserves the right to waive this requirement and/or schedule additional meetings.

1.15 ADDENDA AND INTERPRETATIONS

A. No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally.

B. Every request for such interpretation should be in writing addressed to: Brackett Krennerich and Associates, P.A., Architects, 100 E. Huntington, Suite D, Post Office Box 1655, Jonesboro,

Arkansas 72401/72403 and to be given consideration must be received at least three (3) days prior to the date fixed for the opening of bids.

C. All such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed and faxed to all prospective bidders (at the respective addresses and fax numbers furnished for such purposes), not later than three days prior to the date fixed for the opening of bids.

D. All addenda so issued shall become part of the contract documents.

1.16 SECURITY FOR FAITHFUL PERFORMANCE

A. Simultaneously with his delivery of the executed contract, the contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under the contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein.

B. The surety on such bond or bonds shall be a surety company duly authorized to do business in the State of Arkansas and satisfactory to the owner.

1.17 POWER OF ATTORNEY

A. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

1.18 TAXES, LAWS, AND REGULATIONS

A. The bidders' attention is directed to the fact that all applicable sales tax, social security taxes, state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout; and they will be deemed to be included in the contract, inspection fees, licenses, and building permits where required.

B. The contractor shall pay for all such taxes and fees required for this project.

C. Labor. Contractors employed upon the work will be required to conform to the labor laws of the State of Arkansas and various acts amendatory and supplementary thereto, and to all laws, regulations, and legal requirements applicable thereto.

D. State licensing laws for contractors.

1.19 DISCRIMINATION

A. Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law.

B. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to discrimination.

C. Upon final determination by a court or administrative body having proper jurisdiction that the Bidder has violated state or federal laws or regulations, the Owner may impose a range for appropriate remedies up to and including termination of the contract

1.20 SUBMISSION OF POST-BID INFORMATION

A. The selected bidder shall within seven (7) days after "Notice of Intent of Award of Contract" submit the following:

1. A statement of costs of each major item of work included in his bid.
2. A designation of the work to be performed by the bidder with his own forces.
3. A list of names of subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design), proposed for the principal portions of the work, including suppliers of major equipment. Prior to the award of the contract, the architect will notify the bidder in writing if either the owner or the architect, after due investigation, has reasonable and substantial objection to any person or organization on such list. If the owner refuses in writing to accept such person or organization, the bidder may, at his option withdraw his bid without forfeiture of bid security, notwithstanding anything to the contrary contained in Paragraph 1.11 "Liquidated

Damages for Failure to Enter into Contract." Subcontractors and other persons and organizations proposed by the bidder and accepted by the owner and the architect must be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the owner and the architect.

a. Note: Subcontractors referred to in above paragraph are those subcontractors other than those listed on bid form. Subcontractors listed on the bid form must be used for work listed in compliance with Arkansas Statutes, Arkansas Code Annotated § 22-9-204.

B. Upon completion of the project, List of Subcontractors, AIA Document G-805, shall be completed to include subcontractors and suppliers of major equipment, complete with names and addresses, along with telephone numbers.

1.21 SUBCONTRACTORS

A. Arkansas Code Annotated § 22-9-204, requires that in each instance where the total bid submitted by the licensed prime contractor exceeds $50,000.00, all prime contractors, as a condition to perform work for and in the State of Arkansas shall use no other subcontractors when the subcontractors' portion of the project is $50,000 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC-R), Plumbing, Electrical and Roofing.

B. For those bids where the listed work is $50,000 or more, the prime contractor must make a definite decision as to which subcontractor he intends to use. The prime contractor shall place the names, licenses of each subcontractor and indicate on the space provided on the Form of Proposal the amount of the listed work is $50,000 or more. The prime contractor may use his own forces to do the listed work, however if the listed work is $50,000 or more, the prime contractor must be qualified and licensed by the Arkansas Contractors Licensing Board to perform the listed work. Once the prime contractor determines his own forces will be used, he shall place his name, license number and indicate on the space provided on the Form of Proposal the amount of listed work is $50,000 or more.

C. In the event, the amount of the listed work is below $50,000, the Prime Contractor shall place the names of the person or firm performing the work and indicate on the space provided on the Form of Proposal the listed work is under $50,000.

D. Failure to fill the form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration.

E. In the event that one (1) or more of the subcontractors named by the prime contractor in his successful bid thereafter refuse to perform his contract or offered contract, the prime contractor may substitute another subcontractor, after having obtained prior approval from the architect or engineer, and the owner.

F. The prime contractor shall submit written evidence that the substituted contractor is costing the same amount of money or less and, if costing less, that his savings will be deducted from the total contract of the prime contractor and rebated to the owner.

G. It shall be mandatory that any subcontractors listed in (A) – (D) on the form of proposal by the Prime Contractor be awarded a contract under Arkansas Code Annotated § 22-9-204.

H. Subcontractors List:
   1. Mechanical H.V.A.C.
   2. Plumbing
   3. Electrical (cannot be included in the Mechanical Bid)
   4. Roofing and Sheet metal

I. Electrical License Requirement
   1. No person shall perform electrical work on the contract without processing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one-to-one ratio.

2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

1.22 STANDARDS OF QUALITY

A. Reference in the specifications to any article, device, product, material, fixture, etc., by name, manufacturer, or catalog numbers, shall be interpreted as establishing a standard of quality and shall not be considered or construed as limiting competition.

B. The contractor may use any article, device, product, material, fixture, etc., which, in the judgment of the architect, and with written approval, is equal to that specified.

1.23 SUBSTITUTION APPROVAL

A. Request for approval and/or substitutions prior to the time/date for receiving bids on this project shall be submitted to the architect, in written form, only through general contractors or prime contractors who propose to submit bids.

B. Submission of each request shall be in accordance with Section 01 6300 – Product Options and Substitutions.

C. Such requests shall include a complete description of the proposed substitution with drawings, cuts, performance and test data, or information necessary for a complete evaluation.

1.24 METHOD OF BIDDING

A. Base Bid:

1. Base bid to be a lump sum bid including all construction work required to complete the total project in accordance with the requirements of the contract documents and shall cover all new construction including Site Work, Mechanical H.V.A.C. Work, Plumbing Work, Electrical Work, Roofing and Sheet metal Work.

1.25 EVALUATION AND CONSIDERATION OF BIDS

A. It is the intent of the Owner to award a contract to the lowest responsive, qualified Bidder provided the bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available.

B. The Owner shall have the right to waive formalities in a bid received and to accept the bid which, in the Owner's judgment, is in the Owner's own best interests.

C. The Owner shall have the right to accept any bid for a period not to exceed 30 days.

D. Bids will be considered on the basis of price; however, the Owner reserves the right to establish the award criteria and to reject any or all and to award the Contract to the firm who, in the judgment of the Owner, is the best qualified to perform the work.

1.26 TIE BIDS

A. If two or more sealed bids are equal in amount, meet specifications, and are the lowest received at the bid opening, then the apparent low bidder will be determined by lot (placing the name of the tie bidders into a container and drawing one name).

B. The drawing will be done by the owner or another person so designated by the owner in the presence of a witness and tie bidders. The witness shall be an employee of the Owner.

C. Documentation of the drawing must be included on the bid tabulation and signed by those present.

D. Nothing in the above and foregoing will diminish the owner's reserved right to reject any and all bids and to waive formalities.

1.27 MODIFICATION, WITHDRAWAL AND SCRIVENER'S ERROR

A. Modification and Withdrawal. Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be considered. Bidder may submit written modifications to bid in writing, or by facsimile at any time prior to the expiration of the bidding time and date and shall so word the modification(s) as

to not reveal the amount of the original bid. Facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.

B. Scrivener's Error. Pursuant to Ark. Code Ann. § 19-4-1405 (e), bidders may request in writing, to be relieved of their bid any time after the bid opening, but no later than 72 hours after receiving the intent to award, excluding Saturdays, Sundays and holidays. Scrivener's error is an error in the calculation of the bid which can be documented by clear and convincing written evidence and which can be clearly shown by objective evidence drawn from inspection of the original work papers, documents, or materials used in preparation of the bid sought to be withdrawn; and the bid was submitted in good faith and the mistake was due to a calculation or clerical error, an inadvertent omission, or typographical error as opposed to an error in judgment.

C. Failure to make a timely request constitutes a waiver by the bidder of the bidder's right to claim that the mistake in his or her bid was a scrivener's error.

1.28 DISQUALIFICATION OF BIDDERS.

A. The Owner shall have the right to disqualify bids (before or after opening), which includes but is not limited to, evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder, to reject a bid not accompanied by the required bid security or by other data required by the Contract Documents, or to reject a Bid which is in any way incomplete or irregular.

B. The Owner may reject any and all bids and may reject a bid of any party who has failed to perform, been unfaithful and/or delinquent in any former relationship with the Owner. The Owner reserves the right to waive any irregularities or formalities in any solicitation or bid response. The Owner shall be the sole judge as to which bid is best and, in determining that fact, may consider the contractor's business integrity, financial resources, experience, facilities and/or capacity for performing the work.

1.29 EXECUTION OF CONTRACT.

A. The successful Bidder shall be prepared, if so, required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract.

B. The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance and a copy of the policies showing all endorsement, exclusions within 10 days after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond. The owner's notice to proceed shall not be issued until the insurance policies have been reviewed and approved by the owner.

C. The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by the General Conditions and Supplementary General Conditions.

1.30 RESERVATIONS

A. The invitation to bid does not commit the Owner to award a contract, to pay any costs incurred in the preparation of a bid in response to this invitation, or to procure or contract for services or supplies. The Owner reserves the right to accept, or reject, in part or its entirety, any bid received as a result of this invitation, if it is in the best interest of the Owner to do so.

END OF SECTION

SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

EXISTING REPORTS AND SURVEYS

1.01 LIMITED ENVIRONMENTAL STUDY (ASBESTOS REPORT)

A. A copy of an Asbestos Inspection Report with respect to the Craighead County Courthouse is included following this section.
   1. Title: Asbestos Inspection Report: Craighead County Courthouse, Project #LITP002025. 511 South Main Street. Jonesboro, Arkansas
   2. Date: October 16, 2024 (inspection date)
   3. Prepared by: Snyder Environmental
   4. Project Number: #LITP002025

B. This survey identifies asbestos screening prepared to indicate hazardous materials for the existing Craighead County Courthouse

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SNYDER™ ENVIRONMENTAL
An EIS Holdings, LLC company

ASBESTOS INSPECTION REPORT

Craighead County Courthouse
Project #LITP002025
511 South Main Street
Jonesboro, AR

prepared for:
Brackett-Krennerich Architects
ATTN: Mr. Kyle Cook, A.I.A
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prepared by:
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Table of Contents

ASBESTOS INSPECTION REPORT

for

Craighead County Courthouse
Project #LITP002025
511 South Main Street
Jonesboro, AR

Introduction

This report summarizes findings and recommendations regarding the potential presence of asbestos-containing materials (ACM) in the Craighead County courthouse located at 511 South Main Street in Jonesboro, Arkansas. ADEQ Licensed Inspectors, Justin Stuart & Justin Dixon, performed the on-site study to: 1) identify suspect homogeneous materials, 2) collect bulk samples for analysis, and 3) quantify suspect homogeneous materials. The on-site investigation was performed on 16 October 2024.

Purpose of Study

The purpose of this study was to confirm or deny the presence of asbestos in the site materials intended to be disturbed, or likely to be disturbed during the course of future renovation or demolition projects, to identify the location of the ACM, to provide response action recommendations, and to facilitate the renovation or demolition schedule. This inspection meets the Arkansas Department of Environmental Quality's (ADEQ) requirement for a "thorough inspection" for asbestos.

Sampling Plan

DEFINITIONS: Homogeneous materials are those building materials that, by visual and manual inspection, are similar in texture, color, composition and use in the building, and are deemed to be the same material. Suspect homogeneous materials are homogeneous materials that are likely to or are suspected of containing asbestos. Friable materials are those materials that are easily crumbled, crushed or pulverized by hand/finger pressure. A building material is defined as an "asbestos-containing" material (ACM) by the U.S. EPA and state regulations if that material contains >1% asbestos.

If all samples collected of a homogeneous material, subsequent to analysis by an EPA accredited laboratory, result in ≤1% or "no asbestos" being detected, the material is deemed to be asbestos free for the purpose of EPA regulations.

Approximately one to three samples were collected from each suspect asbestos containing material. All samples were collected in a random fashion in order to evaluate the asbestos content of each homogeneous material. Determination of homogeneous materials includes material type, texture, pattern, color, and size.

Analytical Methodology

Asbestos samples are sent to Eurofins Built Environmental Testing in Houston, TX NVLAP number 200525-0. Samples are analyzed via Polarized Light Microscopy (PLM) with dispersion staining.

Findings

During the inspection, six (6) suspect homogenous materials were identified and twelve (12) bulk samples were collected. The table below summarizes the suspect homogenous materials sampled and the analytical results:

Sample #	Description	Location	Percent Asbestos	Condition
511-01-01 511-01-02	**Brown FT / Mastic beneath Carpet Squares**	**Top Floor – Court Security Office**	***2-5% Chrysotile***	**Good**
511-02-03 511-02-04	2x4 Lay-in Ceiling Tile	Top Floor – Court Security Office	ND	Good
511-03-05 511-03-06	Joint Compound	Various DW Partitions on Top Floor	ND	Good
511-04-07 511-04-08	**Gray 12x12 FT over Brown FT / Mastic**	**Hallway in front of Court Room**	***2-5% Chrysotile***	**Good**
511-05-09 511-05-10	2x4 Lay-in Ceiling Tile	Hallway in front of Court Room	ND	Good
511-06-11 511-06-12	Tan 12x12 FT	Main Floor – Sky Bridge Hallway	ND	Good
511-07-13 511-07-14	2x4 Lay-in Ceiling Tile	Main Floor throughout	ND	Good
511-08-15 511-08-16	**White 12x12 FT over Brown FT / Mastic**	**Main Floor - County Clerk's Office**	***2-5% Chrysotile***	**Good**
511-09-17 511-09-18	**Brown FT / Mastic beneath Carpeting**	**Offices on West side of Main Floor**	***2-5% Chrysotile***	**Good**
511-10-19 511-10-20	Tan 12x12 FT over White FT / Mastic	Main Floor – Circuit Clerk's Office	ND	Good
511-11-21 511-11-22	**Tan/Black 12x12 FT over White FT / Mastic**	**Bottom Floor – Main Hallway**	***2-5% Chrysotile***	**Good**
511-12-23 511-12-24	2x4 Lay-in Ceiling Tile	Bottom Floor throughout	ND	Good
511-13-25 511-13-26	**Tan 12x12 FT / Mastic**	**Bottom Floor – Break Room**	***3% Chrysotile***	**Good**
511-14-27 511-14-28	Tan/White 12x12 FT / Mastic	Bottom Floor – Circuit Clerk's Vault	ND	Good
511-15-29 511-15-30	Tan 12x12 FT / Mastic	Bottom Floor – Circuit Clerk's Storage	ND	Good

*ND – No Asbestos Detected

Positive ACM Materials
The samples of the suspect homogeneous areas were analyzed for asbestos content. Analysis was performed via polarized light microscopy. Six (6) of the homogeneous materials returned with regulated amounts of asbestos.

Report of Findings

Six (6) materials tested positive for greater than 1% asbestos. The following table lists the homogeneous areas that were found to contain greater than 1% asbestos.

Sample #	Description	Location	Percent Asbestos	Quantity
511-01-01 511-01-02	Brown FT / Mastic beneath Carpet Squares	Top Floor – Court Security Office	*2-5% Chrysotile*	Approx. 288 SF
511-04-07 511-04-08	Gray 12x12 FT over Brown FT / Mastic	Hallway in front of Court Room	*2-5% Chrysotile*	Approx. 318 SF
511-08-15 511-08-16	White 12x12 FT over Brown FT / Mastic	Main Floor - County Clerk's Office	*2-5% Chrysotile*	Approx. 1,680 SF
511-09-17 511-09-18	Brown FT / Mastic beneath Carpeting	Offices on West side of Main Floor	*2-5% Chrysotile*	Approx. 2,705 SF
511-11-21 511-11-22	Tan/Black 12x12 FT over White FT / Mastic	Bottom Floor – Main Hallway	*2-5% Chrysotile*	Approx. 1,054 SF
511-13-25 511-13-26	Tan 12x12 FT / Mastic	Bottom Floor – Break Room	*3% Chrysotile*	Approx. 418 SF

Limitations

Unless specifically authorized in the proposal to use destructive means, no subsurface, or encased systems such as plumbing, electrical, HVAC, etc. inside walls and considered inaccessible were inspected, sampled or analyzed. Wire Housing and/or electrical components will not be sampled unless a licensed electrical contractor has disconnected all power and lock out/tag out procedures are in place as per OSHA Regulation. Roof systems, if sampled, must be done so in conjunction with a roofer, engaged by the owner to provide patching necessary to prevent leakage and maintain any roofing warranty that may exist.

No guaranty or warranty, implied or otherwise, is extended regarding the existence or non-existence of asbestos in the building materials. No guarantee, implied or otherwise, is provided regarding quantities identified. This is inspection is for the condition of the facility only as of the time of the inspection. Building components could be added that contain ACM, hazardous or other regulated material or a change in the Condition could occur over time. Any suspect materials subsequently discovered during repair, renovation, or demolition that were not sampled, should be sampled, if practicable, and analyzed for asbestos content.

Regulatory Requirements and Recommendations

EPA and OSHA regulations require proper training and monitoring of all personnel involved in the regulated asbestos removal and/or the renovation/demolition activities. Demolition activities will require a 10-day Notice of Intent to ADEQ, regardless of the presence of asbestos containing materials. Renovation activities involving regulated asbestos containing material (RACM) in quantities greater than 160 square feet or 260 linear feet will require a 10-day Notice of Intent to ADEQ before abatement.

Asbestos Containing Brown FT / Mastic beneath Carpet Squares (Sample# 511-01-01 & 02): The asbestos containing brown floor tile AND associated black mastic located in the top floor court security office is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Asbestos Containing Gray 12x12 FT over Brown FT / Mastic (Sample# 511-04-07 & 08): The asbestos containing brown floor tile AND associated black mastic located beneath the visible gray 12x12 floor tile in the hallway in front of the courtroom is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Asbestos Containing White 12x12 FT over Brown FT / Mastic (Sample# 511-08-15 & 16): The asbestos containing brown floor tile AND associated black mastic located beneath the visible white 12x12 floor tile in the County Clerk's office on the main floor is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Asbestos Containing Brown FT / Mastic beneath Carpeting (Sample# 511-09-17 & 18): The asbestos containing brown floor tile AND associated black mastic located beneath carpeting throughout the offices on the west side of the main floor is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Asbestos Containing Tan/Black 12x12 FT over White FT / Mastic (Sample# 511-11-21 & 22): The asbestos containing tan/black 12x12 floor tile over white floor tile AND associated black mastic located in the main hallway of the bottom (basement) floor is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Asbestos Containing Tan 12x12 FT / Mastic (Sample# 511-13-25 & 26): The asbestos containing black mastic associated with the white/tan floor tile located in the bottom floor (basement) break room is considered a Category I Non-Friable asbestos containing material (ACM). It is recommended that these materials be removed by an ADEQ certified Asbestos Abatement Contractor prior to its disturbance by future demolition or renovation projects.

Disclaimer

Conclusions presented are based on laboratory results of random samples taken from what appear to be homogeneous materials. Snyder Environmental, Inc. is not responsible for the analysis of those samples. Inferences drawn from sampling are subject to error, and the company is not responsible for this error.

This Inspection Performed by:

Justin Stuart

Justin Stuart
Inspection Coordinator
AR Certified Inspector #015878
Snyder Environmental

This Report Prepared by:

Justin Stuart

Justin Stuart
Inspection Coordinator
AR Certified Inspector #015878
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This Inspection Performed by:

Justin Dixon

Justin Dixon
President
AR Certified Inspector #013021
Snyder Environmental

This Report Reviewed by:

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President
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APPENDIX A

Laboratory Analysis Reports

22 Oct 2024

003820987

ACM SAMPLES

SNYDER ENVIRONMENTAL
7705 NORTHSORE PLACE
NORTH LITTLE ROCK, AR 72118

PHONE: 501-801-2773
FAX: 501-907-1129

PROJECT #: LITP002025

Inspection Field Sheet

Date Sampled: 16 Oct 2024

Inspector: J. Stuart

Project Name: Craighead County Courthouse Renovation
Project Address: 511 South Main Street
Jonesboro, AR

#	SAMPLE #	MATERIAL	LOCATION	SUB	CONDITION	SF/LF
1	511-01-01 511-01-02	Brown FT / Mastic beneath Carpet Squares	Top Floor – Court Security Office	C	Good	288 SF
2	511-02-03 511-02-04	2x4 Lay-in Ceiling Tile	Top Floor – Court Security Office	N/A	Good	288 SF
3	511-03-05 511-03-06	Joint Compound	Various DW Partitions on Top Floor	DW	Good	TBD
4	511-04-07 511-04-08	Gray 12x12 FT over Brown FT / Mastic	Hallway in front of Court Room	C	Good	318 SF
5	511-05-09 511-05-10	2x4 Lay-in Ceiling Tile	Hallway in front of Court Room	N/A	Good	318 SF
6	511-06-11 511-06-12	Tan 12x12 FT	Main Floor – Sky Bridge Hallway	C	Good	220 SF
7	511-07-13 511-07-14	2x4 Lay-in Ceiling Tile	Main Floor throughout	N/A	Good	9,766 SF
8	511-08-15 511-08-16	White 12x12 FT over Brown FT / Mastic	Main Floor - County Clerk's Office	C	Good	1,680 SF
9	511-09-17 511-09-18	Brown FT / Mastic beneath Carpeting	Offices on West side of Main Floor	C	Good	2,705 SF
10	511-10-19 511-10-20	Tan 12x12 FT over White FT / Mastic	Main Floor – Circuit Clerk's Office	C	Good	1,320 SF
11	511-11-21 511-11-22	Tan/Black 12x12 FT over White FT / Mastic	Bottom Floor – Main Hallway	C	Good	1,054 SF

12	511-12-23 511-12-24	2x4 Lay-in Ceiling Tile	Bottom Floor throughout	N/A	Good	6,650 SF
13	511-13-25 511-13-26	Tan 12x12 FT / Mastic	Bottom Floor – Break Room	C	Good	418 SF
14	511-14-27 511-14-28	Tan/White 12x12 FT / Mastic	Bottom Floor – Circuit Clerk's Vault	C	Good	736 SF
15	511-15-29 511-15-30	Tan 12x12 FT / Mastic	Bottom Floor – Circuit Clerk's Storage	C	Good	748 SF

RELINQUISHED BY: _____ **TIME:** 1800 **DATE:** 2/24/2016

RECEIVED BY: _____ **TIME:** 9:13AM **DATE:** 10/10/16

003820987

Eurofins J3 Resources, Inc.
6110 West 34th Street, Houston, TX 77092
713-290-0221 www.eurofinsus.com/Built

Client: Snyder Environmental
C/O: Justin Stuart
Re: LITP002025; Craighead County Courthouse Renovation

Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Total Samples Submitted:	30
Total Samples Analyzed:	30
Total Samples with Layer Asbestos Content > 1%:	12

Location: 511-01-01 Lab ID-Version‡: 18875647-1

Sample Layers	Asbestos Content
Yellow Carpet Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-01-02 Lab ID-Version‡: 18875648-1

Sample Layers	Asbestos Content
Yellow Carpet Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-02-03 Lab ID-Version‡: 18875649-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-02-04 Lab ID-Version‡: 18875650-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Location: 511-03-05

Lab ID-Version‡: 18875651-1

Sample Layers	Asbestos Content
White Joint Compound	ND
Sample Composite Homogeneity:	Good

Location: 511-03-06

Lab ID-Version‡: 18875652-1

Sample Layers	Asbestos Content
White Joint Compound	ND
Sample Composite Homogeneity:	Good

Location: 511-04-07

Lab ID-Version‡: 18875653-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Tan Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-04-08

Lab ID-Version‡: 18875654-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Tan Mastic	ND
Brown Flooring	ND
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

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Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Location: 511-05-09

Lab ID-Version‡: 18875655-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-05-10

Lab ID-Version‡: 18875656-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-06-11

Lab ID-Version‡: 18875657-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

Location: 511-06-12

Lab ID-Version‡: 18875658-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Yellow Mastic	ND
Black Mastic	ND
Sample Composite Homogeneity:	Good

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Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Location: 511-07-13

Lab ID-Version‡: 18875659-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-07-14

Lab ID-Version‡: 18875660-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-08-15

Lab ID-Version‡: 18875661-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Tan Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-08-16

Lab ID-Version‡: 18875662-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Tan Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 511-09-17

Lab ID-Version‡: 18875663-1

Sample Layers	Asbestos Content
Yellow Carpet Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-09-18

Lab ID-Version‡: 18875664-1

Sample Layers	Asbestos Content
Yellow Carpet Mastic	ND
Brown Flooring	5% Chrysotile
Black Mastic	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-10-19

Lab ID-Version‡: 18875665-1

Sample Layers	Asbestos Content
Tan Floor Tile	ND
Yellow Mastic	ND
Gray Leveling Compound	ND
White Floor Tile	ND
Sample Composite Homogeneity:	Good

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Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Location: 511-10-20

Lab ID-Version‡: 18875666-1

Sample Layers	Asbestos Content
Tan Floor Tile	ND
Yellow Mastic	ND
Gray Leveling Compound	ND
White Floor Tile	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 511-11-21

Lab ID-Version‡: 18875667-1

Sample Layers	Asbestos Content
Beige Flooring	2% Chrysotile
Black Mastic	5% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-11-22

Lab ID-Version‡: 18875668-1

Sample Layers	Asbestos Content
Beige Flooring	2% Chrysotile
Black Mastic	5% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-12-23

Lab ID-Version‡: 18875669-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

Location: 511-12-24

Lab ID-Version‡: 18875670-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	40% Cellulose 10% Mineral Wool
Sample Composite Homogeneity:	Good

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Date of Receipt: 10-18-2024
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ASBESTOS PLM REPORT

Location: 511-13-25

Lab ID-Version‡: 18875671-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Tan Mastic	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-13-26

Lab ID-Version‡: 18875672-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Tan Mastic	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

Location: 511-14-27

Lab ID-Version‡: 18875673-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

Location: 511-14-28

Lab ID-Version‡: 18875674-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

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Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

Location: 511-15-29

Lab ID-Version‡: 18875675-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Tan Mastic	ND
Black Mastic	ND
Sample Composite Homogeneity:	Good

Location: 511-15-30

Lab ID-Version‡: 18875676-1

Sample Layers	Asbestos Content
White Floor Tile	ND
Tan Mastic	ND
Black Mastic	ND
Sample Composite Homogeneity:	Good

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Eurofins J3 Resources, Inc.
6110 West 34th Street, Houston, TX 77092
713-290-0221 www.eurofinsus.com/Built

Client: Snyder Environmental
C/O: Justin Stuart
Re: LITP002025; Craighead County Courthouse Renovation

Date of Receipt: 10-18-2024
Date of Report: 10-22-2024

ASBESTOS PLM REPORT

PROJECT ANALYST AND SIGNATORY REPORT

Project Analyst

Isiah R. Scott

Analyst: Isiah Scott

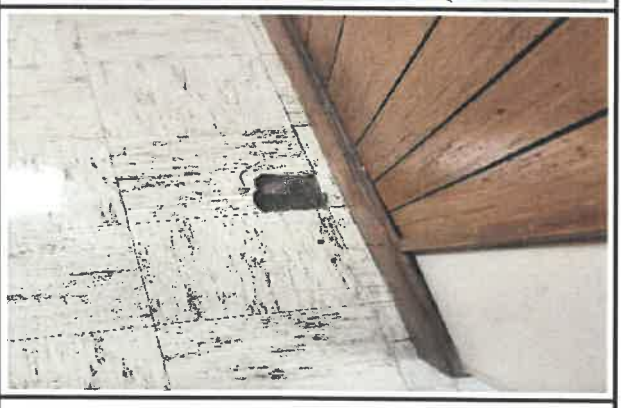
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

APPENDIX B

Photographs

511-01-01 & 02: Brown FT / Mastic beneath Carpet Squares - ***2-5% Chrysotile***	
511-02-03 & 04: 2x4 Lay-in Ceiling Tile	
511-03-05 & 06: Joint Compound	
511-04-07 & 08: Gray 12x12 FT over Brown FT / Mastic - ***2-5% Chrysotile***	

511-05-09 & 10: 2x4 Lay-in Ceiling Tile	
511-06-11 & 12: Tan 12x12 FT	
511-07-13 & 14: 2x4 Lay-in Ceiling Tile	**No Picture Available**
511-08-15 & 16: White 12x12 FT over Brown FT / Mastic - ***2-5% Chrysotile***	

511-09-17 & 18: Brown FT / Mastic beneath Carpeting - ***2-5% Chrysotile***	
511-10-19 & 20: Tan 12x12 FT over White FT / Mastic	
511-11-21 & 22: Tan/Black 12x12 FT over White FT / Mastic - ***2-5% Chrysotile***	
511-12-23 & 24: 2x4 Lay-in Ceiling Tile	**No Picture Available**

511-13-25 & 26: Tan 12x12 FT / Mastic - ***3% Chrysotile***	
511-14-27 & 28: Tan/White 12x12 FT / Mastic	
511-15-29 & 30: Tan 12x12 FT / Mastic	

APPENDIX C

Certifications

ARKANSAS DIVISION OF ENVIRONMENTAL QUALITY

ASBESTOS PROGRAM

JUSTIN STUART

has satisfied the requirements of AHERA/ASHARA under TSCA Title II, and those of Rule 21 of the Arkansas Pollution Control and Ecology Commission, pursuant to Ark. Code Ann. § 20-27-1001 *et seq.*, and is hereby certified to perform certain asbestos-related work, within the State of Arkansas, in the following discipline(s):

Discipline	Expiration Date
Inspector.....	05/31/2025

Certification Number: 015878

Caleb J. Osborne
Director, Division of Environmental Quality
Chief Administrator of the Environment
Arkansas Department of Energy and Environment

ARKANSAS DIVISION OF ENVIRONMENTAL QUALITY

ASBESTOS PROGRAM

JUSTIN S. DIXON

has satisfied the requirements of AHERA/ASHARA under TSCA Title II, and those of Rule 21 of the Arkansas Pollution Control and Ecology Commission, pursuant to Ark. Code Ann. § 20-27-1001 *et seq.*, and is hereby certified to perform certain asbestos-related work, within the State of Arkansas, in the following discipline(s):

Discipline	Expiration Date
Contractor/Sup	05/31/2025
Inspector	05/31/2025
Proj Designer	05/31/2025

Certification Number: 013021

Caleb J. Osborne
Director, Division of Environmental Quality
Chief Administrator of the Environment
Arkansas Department of Energy and Environment

SECTION 00 4100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner: Craighead County, Arkansas.

1.02 FOR:

A. Mechanical Renovations for: Craighead County Courthouse, Jonesboro, Arkansas.

1.03 DATE: _____ (Bidder to enter date)

1.04 SUBMITTED BY: (Bidder to enter name and address)

A. Bidder's Full Name _____

1. Address _____
2. City, State, Zip _____

1.05 OFFER

A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Brackett-Krennerich and Associates, P. A. Architects for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____

(dollar amount is to be shown numerically)

C. We have included the required security Bid Bond as required by the Instructions to Bidders.

D. All applicable federal taxes are included and State of Arkansas taxes are included in the bid sum.

E. All cash allowances described in Section 01 2100 are included in the bid sum.

F. We understand that the owner reserves the right to reject any and all bids and waive any informalities in the bidding.

1.06 UNIT PRICES

A. Hydronic Piping Ball Valve (replacement):

1. If required to replace existing hydronic ball valve at an individual heat pump by Change Order, the unit price set forth below shall apply to such quantities.
2. Add for Hydronic Ball Valve:
   Price per each valve _____($_____)
   (dollar amount to be shown numerically)
3. Any quantity of existing ball valve changes defined on the drawings is to be in the base bid price.

1.07 ACCEPTANCE

A. This offer shall be open to acceptance for thirty days from the bid closing date.

B. If this bid is accepted by the Owner within the time period stated above, we will:

1. Execute the Agreement within Ten (10) days of receipt of Notice of Award.
2. Furnish the required bonds within Ten (10) days of receipt of Notice of Award.
3. Commence work within Ten days after written Notice to Proceed of this bid.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.08 CONTRACT TIME/ LIQUIDATED DAMAGES

A. If this Bid is accepted, we agree that the work will be complete in accordance with the contract documents and ready for Substantial Completion:

B. Complete the work (including all punchlist items) by: **With in 150 days.**

C. Liquidated Damages: **$300.00 (Three Hundred Dollars and 00/100)** for liquidated damages will be assessed to the contractor for liquidated damages for each calendar day that the contractor is in default after the time stipulated in the contract documents.

1.09 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum or price.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.10 LISTING OF MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING WORK

A. All mechanical, plumbing, electrical and roofing work shall be listed regardless of qualifications, licensures or work amount.

B. Bidders should consult the project manual on how to fill out this form. Failure to fill out this form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration.
   1. Indicate the Name(s), License Number(s) of each entity performing the listed work and the amount:

C. MECHANICAL (Indicative of HVACR): Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

D. PLUMBING: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

E. ELECTRICAL: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

F. ROOFING & SHEETMETAL: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

1.11 BID FORM SIGNATURE(S)

A. Company Name: _____

B. Signature: _____

C. Printed Name:_____

D. Title: _____

E. Business Address: _____

F. Contractor's License No._____

G. Seal if bid is by a corporation.

END OF BID FROM

EXHIBIT "A"

Suspension and Debarment

This contract with Craighead County, Arkansas is a covered transaction for purposes of 49 CFR Part 29. As such, the contractor is required to verify that none of the contractor, its principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as defined at 49 CFR 29.940 and 29.945.

The contractor is required to comply with 49 CFR 29, Subpart C and must include the requirement to comply with 49 CFR 29, Subpart C in any lower tier covered transaction it enters into.

By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:

> The certification in this clause is a material representation of fact relied upon by _____. If it is later determined that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to _____, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 49 CFR 29, Subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

_____

(Name of Bidder/Proposer)

_____

(Printed Name of Bidder's Agent)

_____

(Signature of Bidder's Agent)

_____ _____

(Printed Title of Bidder's Agent) (Date Executed)

EXHIBIT "B"

NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee gift, commission or thing of value on account of such sale.

OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated this ___ day of _____, _____

_____
(Name of Organization)

_____
(Title of Person Signing)

_____
(Signature)

ACKNOWLEDGEMENT

STATE OF _____)
) ss
COUNTY OF_____)

Before me, a Notary Public, personally appeared the above named and swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to me this _____ day of _____, _____.

_____
Notary Public Signature

My Commission Expires: _____

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. AIA Document A101 - 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum.

B. Sample copy of Agreement Form is enclosed at the end of this section.

END OF AGREEMENT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Craighead County, Arkansas
Craighead County Annex
511 Union, Room 119
Jonesboro, AR 72401

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Mechanical Renovatins for:
Craighead County Courthouse
Jonesboro, Arkansas

The Architect:
(Name, legal status, address and other information)

Brackett-Krennerich & Associates, P.A.
100 E. Huntington Ave., Suite D
Jonesboro, AR 72401

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
.3 AIA Document A201™–2017, General Conditions of the Contract for Construction
.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

SECTION 00 6000

PROJECT FORMS

1.01 PROJECT FORMS INCLUDED

A. Submittal Transmittal Form

B. AIA Document G702 - 1992 Application and Certificate for Payment

C. AIA Document G703 - 1992 Continuation Sheet

D. AIA Document G701 - 2017 Change Order

E. AIA Document G704 - 2017 Certificate of Substantial Completion

F. AIA Document G706 - 1994 Contractor's Affidavit of Payment of Debts and Claims

G. AIA Document G706A - 1994 Contractor's Affidavit of Release of Liens

H. AIA Document G707 - 1994 Consent of Surety to Final Payment

I. Substitution Request Forms

END OF PROJECT FORMS

SUBMITTAL FORM

PROJECT: **PROJECT#:** **2309D**	Mechanical Renovations: Craighead County Courthouse Jonesboro, Arkansas
ARCHITECT:	Brackett-Krennerich Architects P.O. Box 1655 100 E. Huntington, Suite D Jonesboro, Arkansas 72403-1655
CONSTRUCTION MANAGER/ GENERAL CONTRACTOR:	
SUBCONTRACTOR:	

SPECIFICATION DIVISION NUMBER:

SPECIFCATION SECTION NUMBER:

DESCRIPTION:

SUBMITTED: *(check one)*

- ☐ As Specified:
- ☐ Substitution for Specified Product:

If substitution, product is equal as follows:

Product differs from specifications in following ways:

CONTRACTOR'S STAMP

ARCHITECT'S STAMP

AIA® Document G702® – 1992

Application and Certificate for Payment

TO OWNER:	Craighead County, Arkansas Craighead County Courthouse Annex 511 Union, Room 119 Jonesboro, AR 72401	**PROJECT:**	Mechanical Renovations for: Craighead County Courthouse Jonesboro, Arkansas	**APPLICATION NO:** 001 **PERIOD TO:**	**Distribution to:** OWNER: ☐ ARCHITECT: ☐
FROM CONTRACTOR:		**VIA ARCHITECT:**	Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	**CONTRACT FOR:** General Construction **CONTRACT DATE:** **PROJECT NOS:** 2309D / /	CONTRACTOR: ☐ FIELD: ☐ OTHER: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM		$0.00
2. NET CHANGE BY CHANGE ORDERS		$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$0.00	
b. 0 % of Stored Material (Column F on G703)	$0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$0.00
8. CURRENT PAYMENT DUE		$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA® Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certification for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO: 2309D

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G÷C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**0.00%**	**$0.00**	**$0.00**

User Notes:

(3B9ADAA2)

AIA® Document G701® – 2017

Change Order

PROJECT: *(Name and address)* Mechanical Renovations for: Craighead County Courthouse Jonesboro, Arkansas	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**CHANGE ORDER INFORMATION:** Change Order Number: 001 Date:
OWNER: *(Name and address)* Craighead County, Arkansas Craighead County Annex 511 Union, Room 119 Jonesboro, AR 72401	**ARCHITECT:** *(Name and address)* Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	**CONTRACTOR:** *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	$	0.00
The net change by previously authorized Change Orders	$	0.00
The Contract Sum prior to this Change Order was	$	0.00
The Contract Sum will be increased by this Change Order in the amount of	$	0.00
The new Contract Sum including this Change Order will be	$	0.00

The Contract Time will be unchanged by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

Brackett-Krennerich & Associates, P.A. **ARCHITECT** *(Firm name)*	**CONTRACTOR** *(Firm name)*	Craighead County, Arkansas **OWNER** *(Firm name)*
SIGNATURE	**SIGNATURE**	**SIGNATURE**
Kyle Cook, AIA, President **PRINTED NAME AND TITLE**	**PRINTED NAME AND TITLE**	Marvin Day, County Judge **PRINTED NAME AND TITLE**
DATE	**DATE**	**DATE**

AIA® Document G704® – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)* Mechanical Renovations for: Craighead County Courthouse Jonesboro, Arkansas	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**CERTIFICATE INFORMATION:** Certificate Number: 001 Date:
OWNER: *(name and address)* Craighead County, Arkansas Craighead County Annex 511 Union, Room 119 Jonesboro, AR 72401	**ARCHITECT:** *(name and address)* Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D. Jonesboro, AR 72401	**CONTRACTOR:** *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.
(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE OF SUBSTANTIAL COMPLETION

WARRANTIES
The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:
(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED
A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:
(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: $

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE
OWNER *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE

AIA® Document G706® – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*
Mechanical Upgrades for:
Craighead County
Courthouse
Jonesboro, Arkansas

ARCHITECT'S PROJECT NUMBER:
2309D

CONTRACT FOR: General Construction

CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

TO OWNER: *(Name and address)*
Craighead County, Arkansas
Craighead County Annex
511 Union, Room 119
Jonesboro, AR 72401

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G706®A – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*
Mechanical Renovations for:
Craighead County Courthouse
Jonesboro, Arkansas
TO OWNER: *(Name and address)*
Craighead County, Arkansas
Craighead County Courthouse Annex
511 Union, Room 119
Jonesboro, AR 72401

ARCHITECT'S PROJECT NUMBER:
2309
CONTRACT FOR: General Construction
CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* Mechanical Renovations for: Craighead County Courthouse Jonesboro, Arkansas	**ARCHITECT'S PROJECT NUMBER:** 2309D **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐
TO OWNER: *(Name and address)* Craighead County, Arkansas Craighead County Courthouse Annex 511 Union, Room 119 Jonesboro, AR 72401	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

BRACKETT KRENNERICH architects

SUBSTITUTION REQUEST FORM

To: _____

_____

Project: _____

_____

_____

Commission Number: _____

Date Received: _____

Specification Section Title/Number/Paragraph: _____

Drawing/Details Affected: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Product Description: _____

Differences between proposed substitution and specified product: _____

_____

_____

WHY IS SUBSTITUTION BEING SUBMITTED? (SELECT 1 OF THE FOLLOWING):

☐ Pre-Bid Substitution (Prior Approval): Included detail analysis comparing proposed substitution against specified product, including redlined specification section showing differences.

☐ Specified product is not available. Explain in detail, use attached letter.

☐ Cost savings to Owner. Indicate cost analysis as attachment.

☐ Other. Explain

EFFECTS OF PROPOSED SUBSTITUTION

Answer the following questions and attach explanations.

1. Attach list of at least 3 projects where proposed substitution has been used within past 12 months include Name, address, and telephone number of Owner and Architect.
   (attachment included) (attachment not included, explain)
2. Does substitution affect dimensions indicated on Drawings?
   (No) (Yes, explain)
3. Does substitution affect work of other sections?
   (No) (Yes, explain)
4. Does substitution require modifications to design, changes to drawings, or revisions to specifications?
   (No) (Yes, explain)

CONTRACTORS'S/BIDDER'S REPRESENTATION

Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitutions into the Project per Section 01 6300. A request for substitution constitutes a representation that the Contractor/Bidder has investigated the proposed product and determined that it is equal to or superior in all respects to specified product.

The only response to this Request for Substitution will be by Addendum (if prior to award) or Supplemental Instruction (if after award, unless Change Order is necessary to reduce Contract Amount).

Submitted by: _____

Name: _____

Address: _____

_____

Telephone: _____

Contact person of manufacturer/supplier of proposed substitution: _____

Subcontractor's signature and date: _____

Contractor's signature and date: _____

ARCHITECT'S REVIEW AND ACTION

- ☐ Substitution approved
- ☐ Substitution not approved
- ☐ No Action Required
- ☐ Submission Incomplete, not accepted
- ☐ Submission Too Late for Consideration

Reviewed by: _____ _____ Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E

☐ Other _____

SECTION 00 7200

GENERAL CONDITIONS

1.01 FORM OF GENERAL CONDITIONS

A. AIA Document A201 – 2017 General Conditions of the Contract for Construction, included herewith, is the General Conditions between the Owner and Contractor.

B. The AIA General Conditions and Supplementary Conditions Section 00 7300 of these specifications shall form part of the contract and apply to the contractor and all subcontractors alike.

1.02 SUPPLEMENTARY CONDITIONS

A. Refer to Section 00 7300 for amendments to these General Conditions.

2.01 RELATED REQUIREMENTS

A. Section 00 7300 – Supplementary Conditions.

END OF DOCUMENT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Mechanical Renovations for:
Craighead County Courthouse
Jonesboro, Arkansas

THE OWNER:
(Name, legal status and address)

Craighead County, Arkansas
Craighead County Courthouse Annex
511 Union, Room 119
Jonesboro, AR 72401

THE ARCHITECT:
(Name, legal status and address)

Brackett Krennerich & Associates, P.A.
100 E. Huntington Ave., Suite D
Jonesboro, AR 72401

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

Init.
/

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

PART ONE GENERAL

1.01 INTENT

A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 and other provisions of the Contract Documents as indicated below.

B. All provisions which are not so amended or supplemented remain in full force and effect.

C. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 MODIFICATIONS TO AIA A201 - 2017

A. ARTICLE 1 - GENERAL PROVISIONS
   1. FORM OF AGREEMENT
      a. 1.1., Basic Definitions, add the following subparagraph:
         1) 1.1.1.2, The form of agreement between owner and contractor shall be as defined in Section 00 5200 of the specifications.
   2. 1.1.5 THE DRAWINGS
      a. List of drawings are enumerated in Section 00 0115 of the specifications.

B. ARTICLE 2 - OWNER
   1. Delete 2.1.2 entirely.
   2. Delete 2.2.1 entirely.
   3. Delete 2.3.3 entirely.

C. ARTICLE 3 – CONTRACTOR
   1. LABOR AND MATERIALS
      a. Refer to the following paragraphs:
         1) No. 3.4 - Labor and Materials
         2) No. 3.6 - Taxes
         3) No. 3.7 - Permits, Fees, Notices and Compliance with Laws.
         4) No. 3.13 - Use of Site
      b. See Specifications Section 01 1100, Summary of Work, for additional provisions on these subjects.
   2. CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES
      a. Refer to Section 3.10; See Specifications Section 01 3216, Construction Schedules, for additional provisions on this subject.
   3. DOCUMENTS AND SAMPLES AT THE SITE
      a. Refer to Section No. 3.11, Documents and Samples at the Site:
      b. See Specifications Section 01 7839, Project Record Documents, for additional provisions on this subject.
   4. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
      a. Refer to Section No. 3.12, Shop Drawings, Product Data, and Samples
      b. See Specifications Section 01 3323, Submittals, for additional provisions on this subject.
   5. CUTTING AND PATCHING WORK
      a. Refer to Section 3.14, Cutting and Patching:
      b. See Specifications Section 01 7329, Cutting and Patching, for additional provisions on this subject.
   6. CLEANING
      a. Refer to Section 3.15, Cleaning Up
      b. See Specifications Section 01 7400, Cleaning, for additional provisions on this subject.

7. ACCESS TO WORK
   a. Add the following paragraph:
      1) 3.16.1 Inspection: The contractor awarded this project agrees to allow any Federal or State Inspector, acting in their official capacity, to have access to the jobsite.

D. ARTICLE 5 - SUBCONTRACTS
   1. Refer to 5.2.1 and add the following subparagraph:
      a. 5.2.1.1, See Section 00 2100, of the specifications for additional requirements for subcontractors

E. ARTICLE 7 - CHANGES IN THE WORK
   1. CHANGE ORDERS
      a. 7.2.1, Delete in its entirety and substitute the following:
         1) 7.2.1, The contractor shall present an itemized accounting together with appropriate supporting data for the purposes of considering additions or deductions. Supporting data shall include but is not limited to the following:
            (a) costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and worker or workmen's compensation insurance;
            (b) costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
            (c) rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
            (d) costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
            (e) additional costs of supervision and field office personnel directly attributable to the change.
            (f) The value of all such additions and deductions shall then be computed as set forth in Paragraph 'D'.
         2) The burden of proof of cost rests upon the Contractor. Contractor shall be required, if called upon, to furnish the original bills and payrolls and support the statement with proper affidavits. Burden of proof of costs is upon the general contractor.
         3) In no event shall any understanding or agreement, contract modification, change order or other matter which would constitute a deviation from the terms of this contract be effective or binding upon the owner unless expressly stated and agreed to in writing executed by the owner.
      b. 7.2.1.2 Compute requests for changes be they additions or deductions as follows:
         1) For work directly performed by the General Contractor or a Subcontractor:
            (a) Net cost of material----------a
            (b) State Sales Tax ----------b
            (c) Net Placing cost----------c
            (d) W.C. Insurance Premium and FICA Tax---------d
               (1) Subtotal----------a+b+c+d
            (e) Overhead and profit, 12% X (a+b+c+d)----------e
            (f) Allowable Bond Premium (if applicable)----------f
               (1) TOTAL COST----------a+b+c+d+e+f
         2) Credit for work omitted shall be computed as outlined in (1) "a through e" except the General Contractor or Subcontractor's share of overhead and profit percentage is 7%.
         3) For work performed by Subcontractors the General Contractor Shall:
            (a) Subcontractors shall compute their work as outlined in (1) "a through e". To the cost of that portion of the work (change) that is performed by the subcontractor, the general contractor shall add an overhead and profit charge of Five (5%) percent plus the allowable bond premium.

2. CONSTRUCTION CHANGE DIRECTIVES
   a. Delete 7.3, Construction Change Directives, 7.3.1 through 7.3.10 in its entirety. Changes of work may only be accomplished through the change order process.
   b. Delete reference to construction change directive in paragraph 7.1.2. All changes to work are to be through change order process.

F. ARTICLE 9 - PAYMENTS AND COMPLETION
1. Refer to Section 9.2, Schedule of Values:
   a. See Specifications Section 01 2973 Schedule of Values, for additional provisions on this subject.
2. PAYMENTS TO CONTRACTOR
   a. 9.3 Applications for Payment, add the following subparagraphs:
      1) 9.3.2.1, Act 193 of 2009 amended Arkansas Code Annotated 22-9-604 (a) concerning withholding of retention proceeds in a construction contract, provides that payment to the contractor be as follows:
         (a) Ninety Five percent (95%) of the value of labor executed will be paid to the contractor by the owner in monthly installments as work progresses in proportion to the amount of work executed during monthly period less previous payments. Five percent (5%) will be retained by the owner until final payment. One hundred percent (100%) of all materials delivered and stored on the premises or materials stored in a bonded warehouse approved by the owner will be paid monthly with pay requests
   b. 9.3.2.2, Arkansas Code Annotated 22-9-501, makes provisions for the contractor to withdraw before completions of the project, the retainage withheld by the owner upon deposit of approved government bonds.
3. Add to Subparagraph 9.3.1, Applications for Payment, the following sentence:
   a. The form of Application for payment shall be AIA Document G-702, Application and Certification for Payment, supported by AIA Document G-703, Continuation Sheet.

4. CERTIFICATES FOR PAYMENT
   a. 9.4.1, Add the following:
      1) 9.4.1.1, Deliver three (3) copies of monthly estimates to architect on form to be provided by the architect.
      2) 9.4.1.2, The contractor shall promptly pay each subcontractor, upon receipt of payment from the owner, out of the amount paid to the contract on account of said subcontractor's work. The contractor shall require each subcontractor to make payments to his subcontractors in similar manner. Failure to promptly pay subcontractors shall be cause to call upon the contractor's payment bond for relief.
      3) 9.4.1.3, The owner shall make final payment within 30 days of completion and acceptance of the work. In the event the project extends beyond 30 days, periodic payments shall be made.
5. PAYMENT WITHHELD
   a. 9.5, Decisions to Withhold Certification, add the following subparagraph:
      1) 9.5.1.1, The Owner may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in its opinion to protect the owner from loss because of:
         (a) When periodic payments are made five percent (5%) will be withheld.
         (b) Defective work not remedied;
         (c) Third party claims filed or reasonable evidence indicating probable filing to such claims;
         (d) Failure of the contractor to make payment properly to subcontractors or for labor, materials or equipment;
         (e) Reasonable evidence that the work cannot be completed for the unpaid balance of the contract sum;
         (f) Damage to the owner or another contractor;

(g) Reasonable evidence that the work will not be completed within the contract time; or
(h) Persistent failure to carry out the work in accordance with the contract documents.

6. FAILURE OF PAYMENT
   a. Delete 9.7 entirely.
7. FINAL COMPLETION AND FINAL PAYMENT
   a. Add to 9.10.2:
      1) Forms for "Consent of Surety for Final Payment" and "Contractor's Affidavit of Payment of Debts and Claims," are included at the end of Section 00 6000 1, Project Forms. These forms are required to be submitted to the owner with other close-out documents prior to final payment.

G. ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY
   1. Delete 10.3.3 entirely.
   2. Delete 10.3.6 entirely.

H. ARTICLE 11 - INSURANCE AND BONDS
   1. CONTRACTOR'S INSURANCE AND BONDS
      a. 11.1.1, In the first line following the word "maintain", insert the words "in a company or companies to which the owner has no reasonable objection".
      b. 11.1.1, Add the following new subparagraph:
         1) 11.1.1.2, Liability insurance should include all major divisions of coverage and be on a comprehensive general basis including:
            (a) Premises - Operation (including X-C-U)
            (b) Owner's and Contractor's Protective
            (c) Products and Completed Operations
            (d) Contractual - Including specific provision for the contractor's obligation under Paragraph 11.1.
            (e) The contractor shall purchase from and maintain such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract:
            1) Claims under worker's compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed.
            2) Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees.
            3) Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees.
            4) Claims for damages insured by usual personal injury liability coverage.
            5) Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of sue resulting therefrom.
            6) Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle.
            7) Claims for bodily injury or property damage arising out of completed operations; and
            8) Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.
         2) 11.1.1.3, The insurance required by Subparagraph 11.1.1 and 11.1.1.2 shall be written for not less than any limits of liability required by law or by those set forth below, whichever is greater, and shall include contractual liability insurance as applicable to the contractor's obligations.
            (a) Workman's Compensation - Employer's Liability Limits of $500,000/$500,000/$500,000
            (b) General Liability - $1,000,000 Per Occurrences/$2,000,000 Aggregate

(c) Automobile Liability - A single combined limit for both bodily injury and property damage of $1,000,000 or Per Person/Per Occurrence
(d) Commercial Umbrella Liability - $1,000,000

c. 11.1.4, Add new subparagraph:
1) 11.1.4.1, Furnish in triplicate certificates herein as called for and specifically set forth evidence of all coverage required by 11.1.1,11.1.1.2, and 11.1.2 and the contractor shall furnish to the architect copies of any endorsements that are subsequently issued amending coverage or limits. Certificate of insurance shall be presented on AIA Document G-705, showing that all required insurance is in force before starting any contract work.

2. OWNER'S INSURANCE
a. Delete Article 11.2 entirely.

3. PROPERTY INSURANCE
a. 11.3.1 omit the word owner; replace with contractor
b. Builder's Risk:
1) Add 11.3.1.3 as follows: The contractor shall effect and maintain Builder's Risk insurance as the interest of the owner and contractor may appear. Said insurance shall be written as an all risk coverage or special perils. The coverage shall contain no limitations for earth movement. Insurance shall include theft coverage.
(a) Note: Owner assumes liability for maximum of 10% deductible for earthquake coverage only.
2) Limitations of flood coverage shall not include subsurface pressure or seepage. Faulty workmanship language shall not exclude ensuing loss.
c. 11.3.1.2 delete in its entirety.
d. 11.3.4 delete in its entirety.
e. 11.3.5 delete in its entirety.

4. PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND
a. Refer to Section 11.1., Contractor's Insurance and Bonds
b. Add the following:
1) 11.1.3.1, A successful bidder shall furnish a Performance and Payment bond within 10 days after receipt of the Intent to Award notice. Failure to furnish the required bonds may cause forfeiture of bid guarantee to the owner as liquidated damages.
(a) The Contractor shall furnish a "Performance and Payment Bond" in the amount equal to 100% of the contract price as security for the faithful performance of this contract and for payment of all indebtedness for labor and materials furnished or performed in connection with this contract. The bond shall be written by a surety company which is qualified and is authorized to do business in the State of Arkansas and must be executed by a resident local agent who shall be entitled to full commission paid local agents and who is licensed by the Insurance Commissioner to represent the surety company executing said bond and filing with said bond, his power of attorney as his authority. The mere countersigning of a bond will not be sufficient. The bond shall be written in favor of the Owner and executed. An original and two (2) copies of the bond must be furnished, with power of attorney attached to each. The contractor shall file (not record) the original with the Clerk in the Circuit Court of the County in which the work is to be performed is located. The contractor is to pay all expense incidents to the filing of the bond. The remaining two copies should be certified by the Clerk to evidence the filing of the original and these two copies submitted to the architect for distribution.

I. ARTICLE 14 - TERMINATION OR SUSPENSION OF CONTRACT
1. Delete 14.1.3 entirely and insert the following:

a. If the Owner substantially breaches an obligation in 14.1.1 or 14.1.2 of this Contract, following seven days' written notice to the Owner, the Contractor may terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, construction equipment and machinery, including reasonable overhead, profit and damages for work performed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1100
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 WORK COVERED BY THE CONTRACT DOCUMENTS

A. These specifications shall cover entirely all of the labor and material requirements for the project. The General Conditions of the Contract, Supplementary Conditions, Instructions to Contractor, and any Addenda issued by the architect are hereby made a part of each division or section of these specifications as if bound, repeated, or included therein.

B. In the interest of clarity and brevity, phrases such as "The contractor shall ..." or "The contractor shall furnish and install ..." have been omitted from these specifications.

C. The General Construction Contract shall include all construction work required to complete the total project in accordance with requirements of the contract documents and shall include all heating, air conditioning, ventilating, electrical, and mechanical.
   1. Scope of individual bid packages/contracts to be as defined by the Construction Manager.

D. Contractor's Duties:
   1. Except as specifically noted, provide and pay for:
      a. Labor, materials, and equipment
      b. Tools, construction equipment, and machinery
      c. Water, heat, and utilities required for construction
      d. Transportation and other facilities and services necessary for proper execution and completion of work
   2. Pay all legally required sales, consumer, and use taxes.
   3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
      a. Permits
      b. Government fees
      c. Licenses
   4. Give required notices.
   5. Comply with laws, codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on the performance of work.
   6. Promptly submit written notice to the architect and engineer of observed variance of contract documents from legal requirements. It is not contractor's responsibility to make certain that drawings and specifications shall comply with codes and regulations.
      a. Appropriate modifications to contract documents will adjust necessary changes.
      b. Assume responsibility for work known to be contrary to such requirements without notice.
   7. Enforce strict discipline and good order among the employees. Do not employ on work:
      a. Unfit persons
      b. Persons not skilled in assigned work tasks

1.02 CONTRACTOR USE OF PREMISES

A. Confine operations at site to areas permitted by law, ordinances, permits, and contract documents.

B. Do not unreasonably encumber site with materials or equipment.

C. Assume full responsibility for protection and safekeeping of products stored on premises.

D. Move any stored products which interfere with operation of owner or other contractor.

E. Materials may be stored in approved off-site areas when properly insured in the owner's interest.

1.03 NO SMOKING POLICY

A. Pursuant to the Arkansas Code Annotated § 6-21-609, the Owner has a No Smoking Policy on all properties owned or leased by the Owner.

B. It is the policy of the Owner that all uses of tobacco and tobacco products, including smokeless tobacco, will be prohibited on all properties.

C. This policy applies to all Staff Members, Visitors, General Contractors, Subcontractors, and Vendors. This policy is strictly enforced without exception.

1.04 WORK SEQUENCE / PHASING

A. The contractor is to perform all construction and contract work within the limits of the site at the contractor's schedule.

B. All work shall be performed at the contractor's schedule and within contract time.

C. Any work that requires the interruption of the utility service to any existing building is to be coordinated and scheduled with the owner prior to beginning the work.

D. Any work that is to be completed outside the site is to be coordinated with the owner prior to beginning work.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2976 - Progress Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to contractor or subcontractor, including applicable trade discounts, cost of delivery to site, applicable taxes.

B. Architects 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.

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

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

1.04 ALLOWANCES SCHEDULE

A. Section 04 2000: Include the stipulated sum of **$900.00 per thousand** for purchase and delivery of face brick.

B. Section 23 0923: Include the stipulated sum of **$85,000.00** to provide and install Building Automation System DDC Controls System.

C. Section 26 0000: Include the stipulated sum of **$65,000.00** for the potential modifications of existing electrical system.

D. Include the stipulated sum of **$220,000.00** for the potential modifications to structural components. This amount is above and beyond any structural modifications indicated on contract documents.

PART 2 PRODUCTS

2.01 BAS CONTROLS UNIT COST ALLOWANCE

A. BAS Contractor: Reliable Controls by RGB Mechanical Contractors, Inc. - Attn: Coty Vick – (870) 972-8360.

Scope of work:

1. This project will be integrated into the existing Reliable Controls system being installed in the adjacent building.
2. Provide control wiring for 67 WSHPs with factory BACnet controllers and isolation valves.
3. Provide communication wiring 1 DOAS Unit with BACnet factory mounted controls and wiring of factory field mounted sensors. (all sensors provided with units)

4. Provide BACnet expansion controllers to add new temp sensors, valves, and wiring to existing plant controller for the water loop to include controlling 1 new tower, 1 new boiler, and 2 new pumps.
5. Provide graphics, programming, and controller for web based global controller.
6. Provided training on new Reliable Controls DDC control system

a. Provide necessary wiring and network cabling.
b. 1-year parts and labor warranty.

Notes and exclusions:

1. All wiring over 24 volts, by others
2. All dampers and louvers, by others
3. Owner's network and workstation for remote access.
4. Fire Alarm wiring.
5. Nights and weekend labor.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

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.

C. Defect assessment and non-payment for rejected work.

1.02 RELATED SECTIONS

A. Section 00 4100 – Bid Form

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 the independent testing agency retained by the construction manager to provide soil testing services.

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

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

E. Stipulated Sum/Price Measurement: Items measured by volume as a completed item or unit of the Work.

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

G. Engineer's 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 which is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit sum/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.

1.07 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

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

1.08 SCHEDULE OF UNIT PRICES

A. Item: Hydronic Piping and Valves; Section 23 2113.

1. Price to include all labor, equipment, and material to remove existing, disposal, and replacement of existing ball valve at a single heat pump.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2973
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 GENERAL

A. Submit to the architect/engineer schedule of values, at least ten (10) days prior to submitting first Application for Payment.

B. Upon request by architect/engineer, support values given with data that will substantiate their correctness.

C. Submit quantities of designated materials.

D. Payment for materials stored on site will be limited to those materials listed in Schedule of Unit Material Values.

E. Use Schedule of Values only as basis for contractor's Application for Payment.

1.02 FORM OF SUBMITTAL

A. Submit typewritten Schedule of Values on 8-1/2" x 11" white paper.

B. Use Table of Contents of this specification as basis for format for listing costs of work for each of the sections from all divisions.

C. Identify each line item with number and title as listed in Table of Contents of this specification (sections).

1.03 PREPARING SCHEDULE OF VALUES

A. Itemize separate line item cost for each of the following general cost items:
   1. Performance and Payment Bonds
   2. Field Supervision and Layout
   3. Temporary Facilities and Controls

B. Itemize separate line item cost for work required by each section of this specification.

C. Breakdown installed cost into:
   1. Delivered cost of product, with taxes paid
   2. Installation cost

D. For each line item which has installed value of more than 1%, break down costs to list major products or operations under each item.

E. Round off figures to nearest dollar.

F. Make sum of total costs of all items listed in schedule equal to total contract sum.

1.04 PREPARING SCHEDULE OF UNIT MATERIAL VALUES

A. Submit separate Schedule of Unit Prices for materials to be stored on which progress payments will be made.

B. Make form of submittal parallel to Schedule of Values, with each line item identified same as line time in Schedule of Values.

C. Include in unit prices only:
   1. Cost of material
   2. Delivery and unloading at site
   3. Sales taxes

D. Make sure that unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

1.05 REVIEW AND RESUBMITTAL

A. After review by architect/engineer, revise and resubmit Schedule (and Schedule of Material Values) as required.

B. Resubmit revised Schedule in same manner.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 2976
PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Application for payments

B. Defect Assessment

1.02 RELATED SECTIONS

A. Section 00 7300 - 1.02,G, 3, Payments to Contractor

B. Section 01 2973 - Schedule of Values

C. Section 00 6000 - Project forms

1.03 APPLICATIONS FOR PAYMENT

A. Submit four (4) copies of each application on Owner-accepted form to Owner (all copies require original signatures in blue ink).

B. Content and Format: Utilize Schedule of Values for listing items in Periodic Pay Estimate.

C. Submit an updated construction schedule with each Periodic Pay Estimate.

D. Payment Period: Progress payments to be made monthly.

E. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question.

1.04 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect/Engineer and Owner it is not practical to remove and replace the Work, the Architect/Engineer will direct an appropriate remedy or adjust payment.

C. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.

D. The defective Work will be partially repaired to the instructions of the Architect/Engineer, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.

E. The authority of the Owner to assess the defect and identify payment adjustment is final.

F. Non-Payment For Rejected Products: Payment will not be made for rejected products 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.

PART II—PRODUCTS

2.01 NOT USED.

PART III—EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 3113
COORDINATION

PART 1 - GENERAL

1.01 EXAMINATION

A. Each contractor, subcontractor, or supplier shall thoroughly examine the drawings and specifications pertaining to separate contracts and include in his base bid those items for which he will be responsible and for the proper coordination of the work to be performed.

1.02 TRANSITIONS

A. The architect accepts no responsibility for the naming of every item that may be needed to make transitions from the work of one contractor to another. All such transitions shall be the entire responsibility of the contractor, subcontractor, and materials and equipment suppliers involved.

1.03 SCHEDULES

A. General contractor shall coordinate the scheduling of all work.

1.04 LOCATION OF WORK

A. The contractor shall check and verify all measurements and dimensions shown on contract drawings and shop drawings of all the work as it progresses.

B. The proper location of work of all subcontractors, including supports for equipment, shall be the final conclusive responsibility of the general contractor regardless of who is responsible for the layout of the work in the first instance.

1.05 UNLOADING AND HOISTING MATERIALS

A. The contractor, each subcontractor, and each supplier of materials and equipment shall be responsible for the hoisting of their materials and equipment to the proper location for installation in the project.

B. They shall also be responsible for unloading of all materials and equipment at the job site.

1.06 STORAGE OF MATERIALS

A. General contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and equipment and coordinate the storage and execution of their work with his.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 3119
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. See Section 00 2100 – Instructions to Bidders for Pre-Bid Conference.

B. Preconstruction Meeting

C. Progress Meetings

D. Pre-installation Meetings

1.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required: Owner, Architect, Contractor, Contractor's Superintendent, and major subcontractors.

C. Agenda:
   1. Designation of personnel representing the parties in Contract and the Architect.
   2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   3. Scheduling.
   4. Use of premises by Owner and Contractor.
   5. Owner's requirements.
   6. Construction facilities and controls provided by Owner.
   7. Temporary utilities.
   8. Security and housekeeping procedures.
   9. Procedures for testing.
   10. Maintaining record documents.
   11. Inspection and acceptance of equipment put into service during construction.

D. General Contractor is to record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, and those affected by decisions made.

1.03 PROGRESS MEETINGS

A. The General Contractor is to schedule and administer meetings throughout progress of the Work.
   1. Progress meetings to be held monthly until the project is eighty percent complete.
   2. After projection completion reaches eighty percent, progress meetings are to be held every two weeks.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems which impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, and those affected by decisions made.

1.04 PREINSTALLATION MEETING

A. When required in individual specification sections, the General Contractor is to convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four (4) days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of installation, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two (2) days after meeting to participants, with two copies to architect, owner, participants, and those affected by decisions made.

PART 2-PRODUCTS

NOT USED.

PART 3-EXECUTION

NOT USED.

END OF SECTION

SECTION 01 3216
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 SCHEDULE

A. Prepare and submit for architect's approval a projected construction schedule for the entire work.

B. The schedule shall indicate the dates for the starting and completion of various stages and sequence of construction and shall be revised monthly. Submit with contractor's Application for Payment each month.

1.02 FORM

A. Prepare schedule in the form of a horizontal bar chart providing:
   1. Separate horizontal bar column for each major specification section.
   2. Place in chronological order of beginning of each item of work.
   3. Identify each horizontal bar:
      a. By major specification section
      b. By distinct graphic delineation
   4. Horizontal time scale (weeks)
   5. Allow space for denoting of actual progress of the work.
   6. Minimum sheet size: 8-1/2" x 14"

1.03 SCHEDULE UPDATE

A. Update schedules accurately indicating the progress to first day of each month and submit monthly with Application and Certificate for Payment. Updated schedules are to be distributed at monthly progress meetings to all attendees.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 3223
SURVEY AND LAYOUT DATA

PART 1 – GENERAL

1.01 RELATED SECTIONS

A. Section 00 3100 - Available Project Information

1.02 FIELD ENGINEERING

A. Employ a land surveyor registered in the State of Arkansas and acceptable to Architect.

B. Contractor shall locate and protect survey control and reference points. Promptly notify architect of any discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a copy of certificate signed by land surveyor that the elevations and locations of the work are in conformance with the contract documents.

G. Maintain a complete and accurate log of control and survey work as it progresses.

PART 2 – PRODUCTS

2.01 NOT USED.

PART 3 – EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 3323
SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Data
B. Shop Drawings
C. Samples
D. Design Data
E. Test Reports
F. Certificates
G. Manufacturer's Instructions
H. Manufacturer's Field Reports
I. Erection Drawings

1.02 RELATED SECTIONS

A. Section 00 6000 - Project Forms

1.03 PROJECT DATA

A. Manufacturer's standard schematic drawings:
   1. Modify drawings to delete information which is not applicable to project
   2. Supplement standard information to provide additional information applicable to project
B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data
   1. Clearly mark each copy to identify pertinent materials, products, or models
   2. Show dimensions and clearances required
   3. Show performance characteristics and capacities
   4. Show wiring diagrams and controls

1.04 SHOP DRAWINGS

A. Original drawings, prepared by contractor, subcontractor, supplier, or distributor, which illustrate some portion of the work; showing fabrication, layout, setting, or erection drawings.
   1. Prepared by a qualified detailer
   2. Identify details by reference to sheet and detail numbers shown on contract document drawings
   3. Minimum sheet size: 8-1/2" x 11"

1.05 SAMPLES

A. Physical examples to illustrate materials, equipment, or workmanship, and to establish standards by which completed work is judged.
   1. Office Samples: of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of product or material with integrally related parts and attachment devices
      b. Finishes

1.06 DESIGN DATA

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.07 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the owner.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.08 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect/Engineer.

1.09 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the architect/engineer's benefit as contract administrator or for the owner.

B. Submit report in duplicate within 30 days of observation to architect/engineer for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

PART 2—PRODUCTS

2.01 Not Used.

PART 3—EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, project data, and samples prior to submission.

B. Verify:
   1. Field measurements
   2. Field construction criteria
   3. Catalog numbers and similar data
   4. Conformance with Contract Documents
   5. Coordination with other work.

C. Coordinate each submittal with requirements of work, construction schedule, and of contract documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by architect/engineer's review of submittals.

E. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by architect/engineer's review of submittals, unless architect/engineer gives written acceptance and deviations are clearly marked on submittals.

F. Notify architect/engineer in writing at time of submission of deviations in submittals from requirements of contract documents.

G. Begin no work which requires submittals until return of submittals with architect/engineer's stamp and initials or signature indicating review.

H. Contractor is responsible for delays caused by improper submittal procedures or incomplete submittals.

3.02 SUBMISSION REQUIREMENTS

A. Schedule submissions at least 14 working days before dates reviewed submittals will be needed.

B. Each submittal shall be complete and accurate.

C. Accompany submittals with a completed Submittal Transmittal Form containing the information shown in the sample form in Section 00 6000. A separate transmittal form is required for each required submittal.

D. Incomplete or partial submittals will be rejected, without review, and require resubmittal.

E. Submittals may be made of portions of the Work, but each Submittal shall be complete with respect to the information necessary for proper review by Architect and their consultants.

F. Cross out non-related material in the submittal.

G. Submittals shall be sent electronically to the Architect. This document will be stored electronically at the project site for Architect and Contractor access during construction. All documents shall be sent in PDF format and saved in the following method SD_03_3000_01.PDF. Each Shop Drawing shall have specification number and the submittal number for that specification section. The file above indicates specification section 03 3000 submittal number one. Upon completion of the project the contractor is to submit four copies on CD of all Shop Drawings during the project closeout phase. These shall be in PDF format.

H. Submit number of samples specified in each of specifications sections.

I. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. The number of each shop drawing, project data, and sample submitted
   5. Notification of deviations from contract documents
   6. Other pertinent data

J. Submittals shall include:
   1. Date and revision dates
   2. Project title and number
   3. The names of:
      a. Architect/Engineer
      b. Contractor
      c. Subcontractor
      d. Supplier
      e. Manufacturer
      f. Separate detailer when pertinent
   4. Identification of product or material
   5. Relation to adjacent structure or materials
   6. Field dimensions, clearly identified as such
   7. Specification selection number
   8. Applicable standards, such as ASTM number or Federal specification
   9. Identification of deviations from contract documents
   10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with contract documents

K. Failure to comply with the requirements of the Section may result in return of submittal without review.

3.03 RESUBMISSION REQUIREMENTS

A. Make corrections or changes in submittals required by Architect and resubmit when Architect's stamp requires resubmittal.

B. Shop Drawings and Product Data:
   1. Clearly identify all changes made, including those requested by Architect by "clouding" or other suitable means acceptable to Architect. Only changes that are "clouded" will be reviewed on a resubmittal. Architect is not responsible for reviewing resubmittals that are not "clouded" on resubmittal.

B. Samples: Submit new samples as required for initial submittal

C. Contractor is responsible for delays caused by resubmittal process.

3.04 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of shop drawings and project data which carry architect/engineer's stamp, or initialed approval, to:
   1. Contractor's file
   2. Job site file
   3. Record documents file
   4. Other prime contractors
   5. Subcontractors
   6. Supplier
   7. Fabricator

B. Distribute samples as directed.

3.05 ARCHITECT/ENGINEER'S DUTIES

A. Review submittals with reasonable promptness.

B. Review for:
   1. Design concept of project
   2. Information given in contract documents

C. Review of separate item does not constitute review of an assembly in which item functions.

D. Affix stamp, initials, or signature certifying to review of submittal.

E. Return submittals to contractor for distribution.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1—GENERAL

1.01 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Testing and inspection services.

E. Examination.

F. Preparation.

1.02 REFERENCES

A. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction.

B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

C. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

1.03 PRODUCT STANDARDS

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TESTING AND INSPECTION AGENCIES

A. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
   1. Prior to start of work, submit testing laboratory name, address, and telephone number, and names of full time registered engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Testing agency selected must be approved by the owner/architect.

C. Inspection Agency: Comply with requirements of ASTM D3740, ASTM E329, and ASTM C 1077.

D. Laboratory: Authorized to operate in the State of Arkansas.

E. Laboratory Staff: Maintain a full time registered engineer on staff to review services.

F. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

G. Concrete Field Tests

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician Grade 1, according to ACI CP-1 or an equivalent certification program.

PART II—PRODUCTS

2.01 Not Used.

PART III—EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

3.04 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.05 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instruction when necessary.

B. Submit qualifications of observer to architect/engineer 30 days in advance of required observations.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. Refer to Section 01 3323, Shop Drawings. Project Data, and Samples, manufacturer's field reports article.

3.06 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.

C. Agency Reports: After each test promptly submit two copies of report to Brackett Krennerich Architects and contractor. When requested by architect/engineer, provide interpretation of test results. Include the following:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and specifications section.
   6. Location in the project.
   7. Type of inspection or test.
   8. Date of test.
   9. Results of test.
   10. Conformance with Contract Documents.

D. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of the contractor.
   4. Agency has no authority to stop the Work.
   5. Agency has no authority to authorize additional work.

E. Contractor's Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required for contractor's use beyond specified requirements.
   6. Testing and employment of testing agency or laboratory shall not relieve the contractor of obligation to perform work in accordance with requirements of the Contract Documents.

F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

G. Re-testing required because of non-conformance to specified requirements shall be paid for by the contractor. Payment for re-testing or re-inspection will be charged to the contractor by deducting testing charges from the contract sum/price .

3.07 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary heating
   3. Temporary ventilation
   4. Telephone service.
   5. Temporary water service.
   6. Temporary sanitary facilities.

1.02 TEMPORARY ELECTRICITY

A. Provided by Owner.

1.03 TEMPORARY HEATING

A. Provided by Contractor.

1.04 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 TELEPHONE

A. Cellular phone at construction site will be permitted.

1.06 TEMPORARY WATER SERVICE

A. Provided by Owner.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures.
   1. Building rest rooms are not to be used during construction.

B. Provide at time of project mobilization.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barriers to protect the Owner's staff.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 5710
EXCAVATION SAFETY PROCEDURES

PART 1 GENERAL

1.01 SCOPE

A. In accordance with Arkansas Code Annotated 22-9-212, the contractor shall include a separate pay item for trench or excavation safety systems for any trench or excavation which equals or exceeds five (5) feet in depth and this pay item shall be a part of the contract price.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials used must meet OSHA regulations.

PART 3 EXECUTION

3.01 METHODOLOGY

A. It is the contractor's responsibility to comply with regulations for excavation safety systems.

B. The Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System 29 CFR 1926, Subpart P applies to this project in the event that any excavation is 5 feet or greater.

END OF SECTION

SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE

A. Under regulation of the Department of Pollution Control and Ecology, the contractor shall be responsible for implementing pollution control methods for controlling storm water run-off from the construction site.

1.02 METHODOLOGY

A. Site of construction is equal to or in excess of 1 acre but less than 5 acres and is classified as a small construction site.

B. Arkansas Department of Environmental Quality (ADEQ) Requirements:
   1. Send "Notice of Intent" to ADEQ at least 48 hours prior to commencement of construction.
   2. Pay permit fee to ADEQ.
   3. Send copy of Storm Water Pollution Prevention Plan (SWPPP) to ADEQ for review before construction.
   4. Post Permit Certificate received from ADEQ at construction site.
   5. Use best management practices to reduce run-off.
   6. Inspect SW controls bi-monthly.

1.03 SWPPP PLAN

A. Drawing included in contract documents for the Storm Water Pollution Prevention Plan prepared by Associated Engineers and Testing, LLC, 103 S Church Street, Jonesboro, Arkansas, 72401.

B. See Storm Water Pollution Plan included at the end of this section.

1.04 FORMS

A. "Notice of intent for discharges of storm water run-off associated with construction activity" is included at the end of this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch Cover: Straw from threshed rice, oats, wheat, barley or rye; of wood excelsior; or from hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue or other legumes or grasses, or a combination thereof. Mulch shall be dry and reasonably free of Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All materials will be inspected and approved prior to use.

B. Straw Bales: Straw for barrier bales shall consist of rice, oat, barley, wheat or rye straw or of available grasses free of an excessive amount of noxious weeds. Bales shall weigh approximately 35 lbs. Straw in an advanced state of decomposition will not be acceptable.

C. Filter Fabric: Typar 3401, Trevira S1115, or approved equal nonwoven polypropylene or polyester fabric.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Submit permits as required.

B. Follow all ADEQ requirements.

C. Ensure that earthwork and final grading in area requiring erosion control have been brought to grade as required by contract documents.

D. Straw Bale Filter: Tightly bound straw bales embedded at least 4 inches into soil and each bale held in place by 2 stakes driven at least 18 inches into ground. Bales shall tightly abut adjacent bales. Strings shall not touch the ground.

E. Silt Fence: Fence post spaced no more than 10 feet apart and driven a minimum of 2 feet into ground. Post shall extend minimum of 2 feet above ground. Fasten metal mesh fence with 6 inch or smaller openings to fence posts to reinforce silt fence fabric. Mesh fence to extend 2 feet above grade and 4 inches into grade. Mesh may be omitted if reinforced silt fence fabric is used or in areas of low flow.

F. Nonvegetative Soil Stabilization: Utilize temporary nonvegetative soil stabilization to provide protection against excessive soil erosion over a short period of time. Required in areas that experience high water flows and high run-off velocities and at disturbed slopes steeper than 2:1.
   1. Mulch: Apply at 1.5 to 2.5 tons per acre.
   2. Anchor by peg and twine, mulch netting, erosion control, fabric, jute matting or mulch anchoring tool.

END OF SECTION

SECTION 01 5719
ENVIRONMENT PROTECTION

PART 1 GENERAL

1.01 DEFINITIONS

A. For the purpose of these specifications, environment protection is defined as the preservation of the environment in its preconstruction state to the greatest feasible extent throughout project construction.

1.02 QUALITY CONTROL

A. The Contractor shall inspect all environment protection operations for compliance with the contract requirements, perform all test as required, and maintain records of his quality control for all operations, including but not limited to the following: Compliance with all Federal, State and local pollution control regulations.
   1. Monitoring and surveillance procedures.
   2. Site access, parking, and traffic control of equipment.
   3. Locations of temporary facilities and support activities.
   4. Handling, storage, use, and disposal of petroleum products, chemicals, and toxic materials.
   5. Solid and liquid waste disposal.
   6. Noise control, dust control, and pest control.
   7. Disposal of construction materials and other debris.
   8. A copy of these records, including all tests performed and corrective actions taken, shall be furnished to the architect/owner.

1.03 NOTIFICATION

A. The Owner/Architect will notify the Contractor in writing of any non-compliance with any applicable Federal, State, or local laws or regulations. The Contractor shall, after receipt of such notice, immediately inform the Architect of proposed corrective action and take such action as may be approved. If the Contractor fails or refuses to comply promptly, the Owner/Architect may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time, or for excess costs or damages by the Contractor. The Architect shall be notified of any spillage of hazardous chemicals in excess of 2 gallons.

1.04 SUBCONTRACTORS

A. Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

1.05 PROTECTION OF LAND RESOURCES

A. The Contractor shall confine his construction activities to areas on the site as determined and outline at the Preconstruction Meeting.

1.06 PROTECTION OF WATER RESOURCES

A. General:
   1. The Contractor shall not pollute storm water with fuels, oil, bitumens, calcium chloride, acids, or other harmful materials. The Contractor shall investigate and comply with all applicable Federal, State, County and municipal laws concerning pollution of rivers and streams.

B. Spillages:
   1. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, and concrete drainage from entering storm water system.

C. Disposal:
   1. Disposal of any materials, wastes, effluents, trash, garbage, oil grease, chemicals, etc., in areas adjacent to streams shall not be permitted. Particular attention under this provision shall be given to lubricants and fuels drained from equipment and supply tanks.

1.07 DISPOSAL OF DEBRIS

A. All materials resulting from construction operations of such as undercut material, and debris shall be disposed of off-site by the Contractor as per Arkansas Department of Environmental Quality-Solid Waste Division regulatory requirements. The Contractor shall be responsible for compliance with all Federal, State, and local laws and regulations applicable to disposal of these materials. The contractor shall disclose the disposal site in the pre-construction conference. If private property is selected as disposal site, the property owner's written consent shall be furnished to the owner/architect.

B. Disposal of petroleum, oil, and lubricants (POL) products, chemicals, or other hazardous or toxic components, may require EPA approval or permits from the state. Where such permits are required, the Contractor shall be responsible for obtaining such permits and shall be responsible for the payment of any fines or penalties for failure to do so.

1.08 DUST CONTROL

A. The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which would exceed allowable limits of the standards for air pollution.

1.09 NOISE CONTROL

A. The Contractor will be required to comply with Federal, State and local requirements for noise control of his vehicles and equipment.

1.10 EROSION CONTROL

A. The Contractor will be required to comply with Federal, State and local requirements for erosion control. The erosion control guidelines included with the project manual and erosion control measures as shown on the plans shall be followed throughout the construction.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

1.02 RELATED SECTIONS

A. Section 00 2100, Instructions to Bidders - Standards of Quality.

B. Section 01 6300 – Product Options and Substitutions

1.03 PRODUCTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

1.04 PRODUCT DELIVERY REQUIREMENTS

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

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

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

1.05 PRODUCT STORAGE AND HANDLING REQUIREMENTS

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

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

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

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection. When products are stored off-site, they must be inventoried by Architect before payment can be made. Insurance certificates must name the owner as certificate holder/beneficiary.

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

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

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

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

1.06 PRODUCT OPTIONS

A. See Section 01 6300 – Product Options and Substitutions

1.07 PRODUCT SUBSTITUTION PROCEDURES

A. See Section 01 6300 – Product Options and Substitutions

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 6300
PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Special definitions
B. Methods of specifying
C. Substitution procedures

1.02 RELATED SECTIONS

A. Section 00 2100, Instructions to Bidders – Substitution Approval
B. Section 0 6000, Project Forms – Substitution Request Form

1.03 DEFINITIONS

A. **Standard of Quality:** Specified manufacturers, materials, products, and equipment have been used in preparing the Contract Documents and thus establish minimum qualities for performance and appropriateness.
   1. Materials, products, and equipment, described in the Contract Documents establish a standard of required function, dimension, appearance, and quality.
   2. Comply with specifications and reference standards as minimum requirements.
   3. Where a particular manufacturer and product is indicated, followed by a description of the product (material and equipment) including special features or performance criteria, the manufacturer shall agree to make necessary modifications to their "Standard or Custom Products" to fully comply with the product described.

B. **Material Base Bid:** as specified.
C. **Material Equivalency:** to be determined as stated below.
D. Under the "Or Equal" clause, other manufacturers, and products which are equal in size, design, function, and performance are acceptable for substitution into the project only when the following requirements are complied with:
   1. Requests to use "Or Equal" products must be made to the Architect by indicating requested "Or Equals" on the Subcontractor/Material List. Subcontractor/Material List and all requests for "Or Equals" must be received by the Architect within 7 days prior to receipt of bids. Requests received after said date may be considered or rejected at the discretion of the Architect.
   2. Decisions of the Architect concerning review of "Or Equal" products are final.

E. **Substitutions:** Requests for changes in products (materials and equipment) and methods of construction required by the Contract Documents are requests for "substitutions".
   1. The following are not defined as substitutions as used herein:
      a. Scope revisions to Contract Documents requested by Owner and Architect.
      b. Specified product options or alternate construction methods included in Contract Documents.
      c. Contractor's determination of and compliance with governing regulations and orders issued by authorities having jurisdiction.

1.04 METHODS OF SPECIFYING

A. **Reference Standard Specifications:** Where products (material and equipment) are specified only by reference standard, provide products complying with standard.
   1. If reference standard is followed by a description of a product's special features, or performance criteria: Modify "Standard or Custom Products" to fully comply with the description of the specified product's special features or performance criteria.

B. **Descriptive Specifications:** Where products (material and equipment) are specified by indicating a detailed description of the required properties, minimum attributes, special features, or performance criteria required, provide products complying with the specified description.
   1. If a description of the required properties, minimum attributes, special features, or performance criteria required, provide products complying with the specified description.
      a. If a manufacturer's standard product is listed in the specification and does not comply with the minimum description indicated, make modifications to the "Standard or Custom Product" to make the product fully comply with the description of the specified product's special features, or performance criteria.
   2. If a list of specified manufacturers includes the following statement "Comparable products of other specified manufacturers", then select product from only manufacturers listed in the Project Manual or addenda complying with the minimum attributes, special features, or performance criteria.
   3. If list of specified manufacturers includes the following statement, "Comparable products of other manufacturers", then select a product from any manufacturer that complies with the minimum attributes, special features, and performance criteria.

C. The design layout, space allocations, connection details, performance criteria, etc., are based on specifically identified proprietary products identified in Part 2 – Products of each specification section.
   1. Other manufacturers, even if listed as "Acceptable Manufacturers", shall comply with the minimum levels of material, detailing, and dimensional restrictions established by the proprietary product.

1.05 SUBSTITUTION TIME FRAME AND CONSIDERATIONS

A. Pre-Bid Substitutions (Prior Approval):
   1. Submittal Time Limit: Not less than 7 days before Bid opening
   2. Consideration: Substitution will only be considered if each request includes the information listed under "Consideration Requirements" Article specified below.

B. Failure to complete "Substitution Request Form" or submit requested information is grounds for rejection.

C. Post-Bid/Pre-Award Substations; Bid Adjustment Substitutions:
   1. Substitution Time Limit: Before Award of Contract date.
   2. Consideration: Substitution will be considered if submitted by the pending Contractor and substitution request is being made because a specified product has become unavailable or potential savings to Owner.
      a. Request shall include information listed under "Consideration Requirements" Article specified below.

1.06 SUPPORTING INFORMATION FOR SUBSTITUTIONS

A. Include the following supporting information: Name of product (material or equipment) for which substitution is being requested and a complete description of the proposed substitute including drawings, product, performance and test data, and any other information necessary for an evaluation.
   1. Substitution Request Form: Completed Substitution Form must accompany each request for substitution.
      a. Include a statement indicating changes in other materials, equipment, or other Work that incorporation of this substitute would require.
      b. Alterations or changes to other Work are the responsibility of the Contractor proposing substitution, including redesign if determined by Architect.
   2. Burden of proof of the merit of the proposed substitute is upon the proposer.

B. It is understood and agreed by bidders, Contractors, material suppliers, and tier subcontractors, that bids and contracts shall be based on products (materials and equipment) and processes as specified or as revised by addenda or modifications.

1.07 CONSIDERATION REQUIREMENTS

A. **Substitution request will be considered by Architect when requested for review by the Owner / CM and the following conditions are satisfied:**
   1. Extensive revisions to Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of Contract Documents.
   3. Substitution Request form is completed and attached. Additionally, 1 or more of the following are satisfied.
      a. If a specified product is not available.
      b. Specified product or method of construction cannot be provided within Contract Time. Request will not be considered if product or method cannot be provided is a result of failure to peruse the Work promptly or coordinate activities properly.
      c. Specified product or method of construction cannot receive necessary approval by a governing authority, and requested substitution can be approved.
      d. Substantial advantage is offered to Owner, in terms of cost, time energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other construction or separate contractors, and similar considerations.
      e. Specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where Contractor certifies substitution will overcome incompatibility.
      f. Specified product or method of construction cannot be coordinated with other materials, and Contractor certifies proposed substitution can be coordinated.
      g. Specified product or method of construction cannot provide warranty required by the Contract Documents and Contractor certifies proposed substitution provides required warranty.

B. Where proposed substitution involves more than 1 installer, installers shall cooperate to coordinate the Work, provide uniformity and consistency, and to ensure compatibility of products.

C. Submit a separate substitution request for each product, supported with complete Product Data, Drawings, and Samples including but not limited to the following:
   1. Comparison of qualities of proposed substitution with specified product.
   2. Changes required in other elements of the Work because of the substitution.
   3. Effect on construction schedule.
   4. Cost data comparing proposed substitution with specified product.
   5. License, fees, or royalties required.
   6. Availability of maintenance service, and source of replacement materials.

D. To determine if proposed substitution complies with the function, appearance, quality, performance, and dimensional characteristics of specified item, Architect may:
   1 Require Sample unit, technical Product Data, and independent test reports sufficient to establish compliance.
      a. Cost of which shall be paid by the submitting party.

1.08 CONTRACTOR'S / BIDDER'S REPRESENTATION

A. A request for substitution constitutes a representation that Contractor / Bidder:

1. Has investigated proposed product and determined that it is equal to or superior in all respects to specified product.
2. Will provide the same or better warranties or bonds for substitution as for the specified product.
3. Will coordinate installation of substitution, if accepted, into the Work; and make other changes as required to make the Work complete
4. Waives claims for additional cost, under his responsibility, which may subsequently become apparent.

1.09 ARCHITECT'S EVALUATION PROCESS

A. Architect is sole judge of acceptability of proposed substitution.

B. Architect will review requests for substitutions with reasonable promptness, and respond as follows:
   1. Request additional information or documentation necessary for evaluation.
   2. Pre Award: Notify Bidders of the decision to accept proposed substitution by written addendum.
   3. Post Award: Notify Contractor in writing of the decision to accept or reject proposed substitution.

C. Accepted substitutions will be documented by Architect's supplemental instruction (ASI or Construction Change Directive (CCD), depending on whether it is necessary to adjust contract amount, including manufacturers' names and catalog numbers.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 7300
EXECUTION REQUIREMENTS

PART 1—GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Demonstration and Instructions

C. Protecting installed construction.

1.02 RELATED SECTIONS

A. Section 01 7329, Cutting and Patching

B. Section 01 7400, Cleaning

C. Section 01 7800, Close-out Submittals

D. Section 01 7839, Project Record Documents

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Provide submittals to Architect that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two (2) weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season.

C. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at the site.

1.05 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.06 USE OF BUILDING

A. Contractor shall allow the owner use of the substantially completed building for placement and installation of equipment. Such use of the structure shall not signify that the owner accepts the building.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 01 7329
CUTTING AND PATCHING

PART 1 GENERAL

1.01 SCOPE

A. Execute cutting (including excavating), fitting, or patching of work required to:
   1. Make several parts fit properly.
   2. Uncover work to provide for installation of ill-timed work.
   3. Remove and replace defective work.
   4. Remove and replace work not conforming to the requirements of contract documents.
   5. Remove samples of installed work as specified for testing.

B. Do not endanger any work by cutting or altering work or any part of it.

C. Do not cut or alter work of another contractor without written consent of architect/engineer.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of project, or work of another contractor, submit written notice to architect/engineer, requesting consent to proceed with cutting, including:
   1. Identification of project
   2. Description of affected work
   3. Necessity for cutting
   4. Affect on other work, on structural integrity of project
   5. Description of proposed work. Designate:
      a. Scope of cutting and patching
      b. Contractor and trades to execute work
      c. Products proposed to be used
      d. Extent of refinishing
   6. Alternatives to cutting and patching
   7. Designation of party responsible for costs of cutting and patching

B. Prior to cutting and patching done on instruction of architect/engineer, submit cost estimate.

C. Should conditions of work, or schedule, indicate a change of materials or methods, submit written recommendation to architect/engineer, including:
   1. Conditions indicating change
   2. Recommendations for alternative materials or methods
   3. Submittals as required for substitutions

1.03 PAYMENT OF COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of architect/ engineer: party responsible for ill-timed, rejected, or non-conforming work.

B. Work done on instructions of architect/engineer, other than defective or non-conforming work: owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for replacement of work removed shall comply with specifications for type of work to be done.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during:
   1. Cutting and patching
   2. Excavating and backfilling

B. After uncovering work, inspect conditions affecting the installation of new products.

3.02 PREPARATION (PRIOR TO CUTTING)

A. Provide shoring, bracing, and support as required to maintain structural integrity of project.

B. Provide protection for other portions of project.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerance, finishes.

B. Execute excavating and backfilling by methods which will prevent damage to other work and will prevent settlement.

C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.

D. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous surfaces: to nearest intersections
   2. Assembly: entire refinishing

END OF SECTION

SECTION 01 7400
CLEANING

PART 1 GENERAL

1.01 SCOPE

A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 RELATED SECTIONS

A. Section 01 5719, Environment Protection

B. Section 01 7300, Execution Requirements

1.03 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with governing safety and insurance standards.

B. Hazard Control:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes such as mineral spirit, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into lakes, streams, or waterways.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning materials manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute cleaning to ensure that grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from site and legally dispose of at public or private dumping areas off owner's property.

3.02 FINAL CLEANING

A. Employ experienced workmen or professional cleaners for final cleaning.

B. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Maintain cleaning until project, or portion thereof, is occupied by owner.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Required documents for final payment.

1.02 RELATED SECTIONS

A. Section 01 7800, Closeout Submittals

B. Section 00 6000, Project Forms

C. Section 01 7839, Project Record Documents

1.03 REQUIRED DOCUMENTS FOR FINAL PAYMENT

A. Contractor to notify the architect in writing that all punch list items are complete and the project is ready for acceptance by the owner.

B. "Substantial Completion" will be issued by the architect, at which time the contractor shall submit the "Final Pay Request".

1.04 DOCUMENTS TO BE SUBMITTED WITH FINAL PAY REQUEST

A. Consent of Surety to Final Payment.

B. Affidavit of Payment of Debts and Claims.

C. Affidavit of Release of Liens.

D. Required Operation and Maintenance Data.

E. Required Warranties.

F. Project Record Documents

G. Special Inspections Reports

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 01 7800
CLOSE-OUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Operation and Maintenance Data

B. Manual for Materials and Finishes

C. Manual for Equipment and Systems

D. Product Warranties and Product Bonds

1.02 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch pages, two D size ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, Listing names, addresses, and telephone numbers of architect/Engineer, Contractor, Subcontractors, and major equipment. suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instruction for equipment and systems.
      f. Maintenance instruction for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Photocopies of warranties and bonds.
   4. Submit two sets of final volumes and two DVD's, CD's, or Flash Drive within 10 days after final inspection.
   5. Final pay requites will not be processed until all close-out documents are received.

1.03 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of manual within 10 days after final inspection. Manual to be as described in 1.02, A-E above.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations.

D. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

E. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

F. Additional Requirements: As specified in individual product specification sections.

G. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

H. Final pay request will not be processed until all close-out documents are received.

1.04 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of manual within 10 days after final inspection. Manual to be as described in 1.02, A-E above.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

Q. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

R. Final pay request will not be processed until all close-out documents are received.

1.05 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify that documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time Of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty or bond period.

1.06 NUMBER OF MANUALS

A. Manuals required in 1.02, 1.03, 1.04 and 1.05 may be combined into one or two manuals if volume of data will permit use of D size ring binders.

PART 2 PRODUCTS

3.01 NOT USED

PART 3 EXECUTION

4.01 NOT USED

END OF SECTION

SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DOCUMENTS:

A. Maintain at the job site, one copy of:
   1. Contract drawings
   2. Specifications
   3. Addenda
   4. Reviewed shop drawings
   5. Change Orders
   6. Other modifications to contract
   7. Field test records

B. Maintain one set of documents in clean, dry, legible condition; documents not to be used for construction purposes.

C. Record all changes made during construction with red pencil.

1.02 RECORDING

A. Label each document "Project Record" in 2" high printed letters.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

D. Contract Drawings: Legibly mark up to record actual construction:
   1. Horizontal and vertical location of underground utilities and appurtenances referred to permanent surface improvements.
   2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
   3. Field changes of dimension and detail.
   4. Changes made by change order or field order.
   5. Details not on original contract drawings.

E. Specifications and Addenda: Legibly mark up each section to record:
   1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
   2. Changes made by change order or field order.
   3. Other matters not originally specified.

F. Shop Drawings: Maintain as record documents; legibly annotate following drawings to record changes made after review:
   1. Plumbing
   2. Mechanical

1.03 SUBMITTAL

A. At completion of project, deliver documents to architect.
   1. One hard copy and one digital copy on DVD, CD, or Flash Drive.

B. Record documents to be submitted with Final Pay Request.

C. Final payment will be not be made until all closeout documents are received by the Architect.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing mechanical and electrical components required for installation of new equipment.

B. Removal of existing building components as described on the drawings.

1.02 RELATED REQUIREMENTS

A. Section 00 2100 – Pre-Bid Conference

B. Section 01 5000 - Temporary Facilities and Controls: Protective Barriers

C. Section 01 5719 - Environment Protection: Disposal of Debris

1.03 REFERENCE STANDARDS

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

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. Protection: Protect existing objects designated to remain. In event of damage, immediately make repairs and replacements necessary to approval of architect at contractor's expense.

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required with a minimum of 3 years of documented experience.

A. Supervision: One person representing the demolition contration must be present during demolition operations. Designated person must be familiar with type of demolition required.

B. Codes and Standards: Comply with pertinent codes and regulations, plus requirements of insurance carriers providing coverage for work.

1.06 DISPOSAL OF DEBRIS

A. All material resulting from demolition operations of material, and debris shall be disposed of off-site by the Contractor as per Arkansas Department of Environmental Quality-Solid Waste Division regulatory requirements. The Contractor shall be responsible for compliance with all Federal, State, and local laws and regulations applicable to disposal of these materials. All materials must be disposed of in a Class 4 land fill.

B. Disposal of petroleum, oil, and lubricants, (POL) products, chemicals, or other hazardous or toxic components, may require EPA approval or permits from the state. Where such permits are required, the Contractor shall be responsible for obtaining such permits and shall be responsible for the payment of any fines or penalties for failure to do so.

1.07 PREPARATION

A. Contractor is to visit the site and carefully inspect items to be demolished. See Section 00 2100, Instruction to Bidders, for Pre-bid meeting.

B. By submitting his/her bid, the bidder acknowledges that he/she has inspected the site and is familiar with all conditions and requirements for demolition work to be completed under this contract.

C. Locate all adjacent utilities. Contractor is to call Arkansas One Call, 811 prior to beginning operations.

D. Contractor is responsible for safety of all operations required under this contract.

1. Follow all OSHA standards for demolition work.

E. Damage to adjacent buildings, property, utilities created by demolition operations is the sole responsibility of the contractor. Repair will be at contractor's expense.

F. Clarification:
   1. Drawings do not purport to show all objects existing on site.
   2. Before commencing work of this section, verify with architect all objects to be removed and all objects to be preserved.

G. Scheduling:
   1. Schedule work in a careful manner with necessary consideration for inhabitants of existing buildings.
   2. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

H. Disconnection of Utilities:
   1. Prior to "Notice to Proceed" the construction manager will disconnect and cap all existing utilities to mechanical equipment to be removed.

I. Preserve in operating condition active utilities bordering or traversing site that are to remain. Protect property, including but not limited to, valve boxes, poles, guys, and related appurtenances. Repair damage to active utility, due to work under contract, to satisfaction of utility concerned.

J. Before starting demolition and removal work, furnish and erect necessary barricades. Consult with owner to arrange to perform work on schedule that will permit owner to continue activities in adjacent buildings with minimum of inconvenience or interruption and to maintain security of premises at all times. Barricades shall provide for safe passage at all times.

1.08 SALVAGE RIGHTS

A. All materials to be demolished and removed under this contract are the property of the demolition contractor. Salvage rights to all materials belong to the demolition contractor.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove from the building/site all materials as shown on the drawings to be removed. All materials shown to be removed are to be removed from the site and disposed of by the contractor.
   1. All existing materials that must be removed for installation of new work required under this contract.

B. Contractor shall demolish all items not specifically called out, if necessary for the installation of the new structures and installation of new mechanical units.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. The general contractor shall familiarize himself/herself with the site and be aware of all site appurtenances. By submitting a bid assumes responsibility for all demolition work to be performed.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

C. Care is to be taken not to damage existing materials to remain. Any damage to existing materials is to be the responsibility of the general contractor.

D. Preparation:
   1. Prior to work of this section, carefully inspect entire site and objects designated to be removed and preserved.

2. Locate existing mechanical lines to be abandoned and determine requirements for disconnecting and capping.
3. Locate existing active utility and mechanical lines which are to remain and determine requirements for their protection.

E. Clarification:
1. Drawings do not purport to show all objects existing on site.
2. Before commencing work of this section, verify with architect all objects to be removed and all objects to be preserved.

F. Scheduling:
1. Schedule work in a careful manner with necessary consideration for inhabitants of existing buildings.
2. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

3.03 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not disrupt public utilities without permit from authority having jurisdiction.

C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to the owner.

D. Before commencing demolition or removal, and if not already accomplished, disconnect or arrange for disconnection of utility service connections, including water, gas, electricity, and telephone, to portions of building to be demolished complying with regulations of utility concerned.

E. Preserve in operating condition active utilities to adjacent building structures. Repair damage to active utility, due to work under contract, to satisfaction of utility concerned.

F. Before starting demolition and removal work, furnish and erect necessary barricades. consult with owner and arrange to perform work on schedule that will permit owner to continue activities in adjacent campus buildings with minimum of inconvenience or interruption and to maintain security of premises at all times. Barricades shall provide for safe passage at all times.

3.04 TEMPORARY SUPPORTS

A. During process of demolition and removal, install temporary supports and bracing to prevent building damage.

3.05 WORKMANSHIP

A. Completely remove all structure as indicated on the drawings. Structures and all interior building materials and components are to be removed including slabs, footing, and underground utilities.

A. All existing concrete paving, walks, etc. as shown on the demolition drawings and as required for completion of work under this contract. All items are to be removed from the site.

B. Any demolition work that will require interruption of existing utility service must be coordinated with the owner.

C. Care is to be taken not to damage existing materials to remain. Any damage to existing materials is to be the responsibility of the Contractor.

D. All materials from demolished structures are the property of the contractor.

3.06 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Dispose of all materials in legal dumping areas and comply with all local ordinances and Federal anti-pollution laws.

C. Leave site in clean condition, ready for subsequent work.

END OF SECTION

SECTION 02 8213

ASBESTOS ABATEMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This specification contains a report with a description of asbestos containing materials that must be abated in conjunction with demolition requirements for this project. These materials have been identified by the Asbestos Inspection Report, prepared by Snyder Environmental following investigation on October 16, 2024 for the existing Craighead County Courthouse located at 511 South Main Street, Jonesboro, Arkansas.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions, Plans, Appendices, and Attachments are hereby incorporated into this section (if applicable).
B. Section 00 3100 – Available Project Information (Asbestos Inspection Report).

1.3 REFERENCES

A. ADEQ-Arkansas Asbestos Abatement Regulation 21
B. OSHA 29 CFR 1926.1101 - Asbestos Exposure in Construction
C. OSHA 29 CFR 1910.1001 –Asbestos Exposure in General Industry
D. OSHA 29 CFR 1910.134 – Respirator Standard
E. OSHA 29 CFR 1926.59 – Hazard Communication Standard
F. EPA 40CFR 763 - EPA Worker Protection Rule
G. EPA 40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants
H. EPA 40 CFR Part 763 Subpart E - Asbestos- Containing Materials in Schools

1.4 SUBMITTALS

A. Pre-Work Submittals: The asbestos abatement contractor shall provide the Prime Contractor with any requested Pre-Start Submittals required by the project specifications, if any.
B. Project Documentation: The asbestos abatement contractor shall keep a copy of each of the following on the project site:
    1. Supervisor and Worker Certifications
    2. Personal Air Monitoring Data
    3. Decon/Reglulated Area Sign in/ Sign Out Sheets
    4. Copy of the Notice of Intent to ADEQ
C. Closeout Submittals: The asbestos abatement contractor shall submit 2 copies of the project closeout document containing the following information, to the Prime Contractor within 20 days after the abatement project's completion. Copies of all items shall be kept by the asbestos abatement contractor for a minimum of thirty years.
    1. Current insurance certifications
    2. Current Asbestos Contractor License.
    3. Copies of any correspondence with authorities and permits.
    4. Employee information including certification, physicals and respirator fit tests.
    5. Daily project logs and supervisor reports.
    6. All air monitoring data for the project.
    7. Sign in/Sign out Sheets
    8. Copies of disposal manifest including name of transporter, employees involved with disposal, and disposal location.

PART 3 EXECUTION

3.1 SUMMARY OF WORK

A. The intent of this scope of work is to abate asbestos containing materials located in areas of required local building demolition. These materials were identified as asbestos containing materials by the Asbestos Inspection Report prepared by Snyder Environmental and included in Section 00 3100 – Available Project Information. The asbestos abatement contractor shall field verify all quantities and locations of materials as indicated by report.

B. General Asbestos Abatement Notes
   1. All asbestos-containing materials shall be maintained adequately wet before, during and after abatement activities.
   2. Abatement shall be accomplished in strict accordance with all Federal, State and Local applicable regulations and Policies and Procedures for Asbestos Abatement.
   3. The asbestos abatement contractor agrees to allow any Federal or State inspector acting in their official capacity to have access to the job site.
   4. This will be a regulated project and will require that a Notice of Intent (NOI) be filed with the Arkansas Department of Environmental Quality (ADEQ). This NOI will require a mandatory 10 working day waiting period, beginning the date of filing, before any abatement work can take place. The asbestos abatement contractor shall comply with this regulatory requirement and will file the NOI with ADEQ and pay the associated filing fee.

3.2 SCHEDULING

A. The project shall be completed with every effort made to adhere strictly to the Prime Contractors Project Schedule.
B. Based on the Prime Contractor provided schedule, the Prime Contractor or Owner's representative shall inform the owner, public and other contractors, if any, of when abatement work will take place.

3.3 PROTECTION OF ADJACENT AREAS

A. Asbestos abatement shall be performed without damage to or contamination of adjacent work or areas to remain.
B. In case of containment failure, asbestos contaminated areas shall be immediately contained and decontaminated to the satisfaction of the Prime Contractor's representative.

3.4 WORKER PROTECTION

A. Prior to commencement of work, the workers shall be instructed and shall be knowledgeable in the types, locations and quantities of asbestos-containing materials in the work areas.
B. Prior to commencement of work, the workers shall be instructed and shall be knowledgeable in types, use and limitations of all personal protective equipment and tools required for this project
C. Respiratory Protection: Provide workers with personally issued and marked respiratory equipment approved by NIOSH and OSHA Standard 29 CFR 1926.1001. Respiratory protection used shall at all times be in compliance or in excess of OSHA requirements. The following is a schedule of minimum respiratory protective equipment to be used during this operation.
   1. Gross removal and cleanup of Class I or II asbestos-containing materials: Workers shall wear half-face air-purifying respirators P-100 filter cartridges.
   2. The contractor shall supply a full-face, powered air-purifying respirator if requested by an employee, regardless of the OSHA job classification.
   3. Final cleaning operations: Workers shall wear half-face air-purifying respirators.
D. Protective Clothing: Workers shall wear full body protection suits when working in regulated area. Provide workers with sufficient sets of full body protective clothing. Such clothing shall consist of full body coveralls and headgear or equivalent sets. Provide eye protection, hard hats, and footwear as required by applicable safety regulations. The asbestos abatement contractor will provide at least four (4) sets of full body clothing per day per inside worker and at least three (3) sets for each outside worker, air monitoring technician, and supervisor. If the asbestos abatement contractor does not use disposable suits equipped with attached foot covering, elastic wrist, and elastic hoods attached these pieces must be provided and secured to each other with "duct" tape or equivalent. Wrist and neck opening must be taped.

3.5 SUPERVISION

A. All work, including the installation and operation of control systems, shall be supervised by a competent person who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan for project supervisor and who has been certified by the Arkansas Department of Environmental Quality as an Asbestos Abatement Project Supervisor.

B. The asbestos abatement contractor's Supervisor prior to the start and following the completion of daily abatement activities shall inspect the work site to insure it is left clean and free of debris. These inspections shall be documented in the daily project log.

3.6 REGULATED AREAS

A. Post approved caution signs and Danger Ribbon in accordance with OSHA regulation 29 CRF 1926.1101.

B. All personnel entering the work area shall read and be familiar with posted regulations, respiratory protection requirements and emergency procedures. All personnel who enter the work area shall sign the visitor's log upon entry and exit of work area.

3.7 NEGATIVE PRESSURE ENCLOSURES (NPE)

A. For the floor tile & mastic abatement phase, a NPE will be installed consisting of critical barriers of 6-mil poly secured and sealed air tight. Splash walls of 4-mil poly will be installed on all walls inside the NPE. An adequate number of HEPA filter equipped air filtration units will be installed to reach and maintain a Negative Pressure of 0.02, which will be measured and continuously monitored by the installed manometer equipped with alarm system that will alert if pressure falls below the 0.02 required level. The NPE will be installed complete with 3-Stage Decontamination Unit. Once the abatement has been completed, and the containment cleared by the certified third-party air monitoring firm, the primary critical barriers and poly coverings shall be removed.

3.8 DECONTAMINATION

A. The asbestos abatement contractor shall establish a 3-stage decontamination unit connected to the regulated area for the decontamination of employees. Each worker and authorized visitor shall, each time he leaves the work area, remove gross contamination from clothing before leaving the work area, clean work clothing with a HEPA vacuum before it is removed.

B. All equipment and surfaces of containers filled with asbestos-containing materials must be cleaned prior to removing them from the equipment area.

C. Each worker and authorized visitor shall follow the decontamination procedures before entering or leaving the work area.

D. Contaminated work footwear shall be stored in a secured area of the regulated area when not in use in the work area. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or seal in disposal container to remain unopened until inside the next containment area. Place contaminated work suits in receptacles for disposal with other asbestos-contaminated materials.

E. Workers shall not eat, drink, smoke, chew gum, or tobacco within the regulated area.

3.9 DISPOSAL PROCEDURES

A. All waste from inside the regulated work area shall be disposed of as asbestos-containing waste. The waste shall be containerized in minimum of two (2) 6-mil bags, wrapped in two (2) layers of 6-mil poly or sealed, leak-tight, drum containers which have been labeled according to EPA, OSHA, and Arkansas regulations.

B. Disposal must occur at an authorized site in accordance with regulatory requirement of NESHAP and applicable State and Local guidelines and regulations. Friable asbestos containing materials will be transported by the asbestos abatement contractor to an approved Class I facility. Non-friable asbestos containing materials will be transported by the asbestos abatement contractor to an approved Class I facility or to an approved and permitted Class IV facility.

C. Once bags or drums have been removed from the work area, they shall be loaded into a dumpster that is to be sealed with 6-mil poly after loading or a fully enclosed waste transport trailer.

D. The inside area of the dumpster shall be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Wall sheeting shall be overlapped and taped into place

E. Personnel loading asbestos-containing waste shall be protected by disposable clothing including head, body and foot protection and at a minimum, half-face air-purifying respirators equipped with HEPA filters.

F. Any debris or residue observed on containers or surfaces outside of work area resulting from clean-up or disposal activities shall be immediately cleaned using a HEPA filtered vacuum and /or wet methods as appropriate.
G. All waste manifests shall be properly completed and provided in the Project Closeouts Documents.

3.10 FINAL CLEANING AND INSPECTION

A. The asbestos abatement contractor will retain a properly certified third party to perform the final visual inspection of each containment prior to clearance testing. The asbestos abatement contractor will correct a list of any deficiencies complied by the properly certified third party representative.

3.11 AIR MONITORING AND CLEARANCE TESTING

A. The asbestos abatement contractor is responsible for providing personnel air samples with a minimum volume of 480 liters, using a 25mm cassette, set at 0.5 to 2.5 liters per minute. At least one STEL sample which is representative of 30-minute exposures associated with operations that are most likely to produce exposures above the excursion limit, shall be collected.
B. The asbestos abatement contractor will retain a properly certified third-party air monitor to perform the final clearance air sampling at the completion of a successful visual inspection. Clearance results at or below 0.01 f/cc will result in a successful clearance and the containment will be removed and the project completed. Clearance results that exceed 0.01 f/cc will result in the re-cleaning of the containment and re-collection of clearance air samples.

END OF DOCUMENT

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Slabs on grade.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements, for testing.

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International. 2002.

G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).

H. ACI 315 - Details and Detailing of Concrete Reinforcing.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.

J. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.

K. ASTM A 185/A 185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

L. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2009b.

M. ASTM C 33 - Standard Specification for Concrete Aggregates; 2008.

N. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2009a.

O. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2009a.

P. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2009.

Q. ASTM C 150 - Standard Specification for Portland Cement; 2007.

R. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

S. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2009.

T. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.

U. ASTM C 330 - Standard Specification for Lightweight Aggregates for Structural Concrete; 2005.

V. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2008a.

W. ASTM C 881/C 881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002.

X. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).

Y. ASTM C 1107/C 1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2008.

Z. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2008).

AA. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

AB. ASTM E 1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers Metric; 1996 (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mix water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Cementitious materials and aggregates.
   2. Form materials and form-release agents.
   3. Steel reinforcement and reinforcement accessories.
   4. Admixtures.
   5. Curing materials.
   6. Floor and slab treatments.
   7. Bonding agents.
   8. Adhesives.
   9. Epoxy joint filler.
   10. Joint-filler strips.
   11. Repair materials.

G. Minutes of preinstallation conference.

H. Reproduction of contract drawings, in any form, will not be accepted as shop drawings.

I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
   1. Concrete flatwork shall be performed utilizing high quality techniques conforming to American Concrete Institute Standards provided for by ACI Publications CP-10, Concrete Flatwork Technician and Flatwork Finisher, ACI Publication CCS-1, Concrete Craftsman Series, Slabs on Grade.

F. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

G. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. See Section 01 4000 for additional requirements.

H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section 01 3119 "Project Meetings".
   1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixes.
      c. Ready-mix concrete producer.
      d. Concrete subcontractor.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished.

B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
   1. Mesh Size: 6x6.

2. Wire Gage: As shown on the drawings.

C. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gage.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal, Type 1A - Air Entraining; Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.
1. Fine Aggregate: Clean, sharp, natural or manufactured sand, free from loam, clay, lumps, or other deleterious substances.
2. Coarse Aggregate: Clean, uncoated, processed, locally available aggregate, containing no clay, mud, loam or foreign matter; maximum size of 1-1/2" at foundations and 1" at slabs.

C. Fly Ash: ASTM C 618, Class C.

D. Water: Clean and not detrimental to concrete.

2.04 CHEMICAL ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.

B. Other Admixtures: Do not use other admixtures unless approved by architect; added chlorides will not be accepted.

2.05 ACCESSORY MATERIALS

A. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.
1. Polyvinyl Acetate (Interior Only):
a. Euclid "Euco Weld"
b. L & M "Everweld"
c. Or approved equal.
2. Acrylic or Styrene Butadiene:
a. Euclid "SBR Latex"
b. L & M "Everbond"
c. Conspec "Strongbond"
d. Master Builders "Acryl-Set"
e. Sonneborn "Sonocrete"
f. Or approved equal

B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.
1. Conspec "Spec-Bond 100"
2. Euclid "Euco Epoxy System #452 or "Dural Fast Set Epoxy System."
3. L & M "Epabond"
4. Master Builders "Concresive Standard Liquid"
5. Or approved equal

C. Non-Shrink Grout: ASTM C 1107/C 1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
2. Minimum Compressive Strength at 28 Days: 7,000 psi.
3. Products:
a. Conspec "100 Non-Shrink Grout (non-metallic)"
b. Euclid "NS Grout."
c. L & M "Crystex"
d. Master Builders "Masterflow 713"
e. W.R. Meadows "Sealtight Cg-86 Grout"
f. Or approved equal

D. Moisture-Retaining Cover: ASTM C 171; clear polyethylene or white burlap-polyethylene sheet.

E. Curing Compound: ASTM C309, Type I, Class A
   1. Moisture loss not more than 0.055 gr/ sq. cm when applied at 200 sq. ft. /gal.
   2. Conspec "Cure & Seal"
   3. L & M "L & M Dress and Seal".
   4. W. R. Meadows "Sealtight CS-309"
   5. Master Builders "MasterKure"
   6. Sonneborn "Kure-N-Seal"

2.06 BONDING AND JOINTING PRODUCTS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or cork, complying with ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch.

B. Construction Joint Forms: To be used on all construction joints in slabs on grade.
   1. Screed Key, Meadow Burke Concrete Accessories, Inc., Denver, Colorado.
   2. Use 3-1/2 inch form for 4 inch thick slab.

C. Expansion Joint Devices: Integral extruded plastic; 1/2 inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

D. Sealant and Primer: As specified in Section 07 9005.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: As scheduled.
   2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
   3. Cement Content:
      a. 3000 psi mix: 470 lbs/yd^3 without air
      b. 4000 psi mix: 564 lbs/yd^3 without air
      c. 4000 psi mix: 611 lbs/yd^3 with air
   4. Water-Cement Ratio:
      1) 3000 psi mix: 0.53 without air
      2) 4000 psi mix: 0.44 without air
      3) 4000 psi mix: 0.40 with air
   e. Total Air Content: 4 percent, determined in accordance with ASTM C 173/C 173M.
   f. Maximum Slump: As scheduled.

2.08 MIXING

A. Transit Mixers: Comply with ASTM C 94/C 94M.
   1. Furnish batch ticket information.
   2. When air temperature is between 85 and 90 degrees F. reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F., reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

3.03 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Brackett Krennerich Architects not less than 24 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Separate slabs on grade from vertical surfaces with joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 9005 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Apply sealants in joint devices in accordance with Section 07 9005.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in checkerboard pattern indicated.

P. Saw cut joints within 12 hours after placing. Use 1/8 inch thick blade, cut into 1/4 depth of slab thickness. Do not allow slab to cure over night before cutting joints. Slab joints must be cut same day slab is placed.

Q. Screed floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155/ASTM E 1155M.

1. All Floors:
   a. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 24.
   b. F(L): Specified Overall Value (SOV) of 25; Minimum Localized Value (MLV) of 17.

3.05 CONCRETE FINISHING

A. Repair surface defects, immediately after removing formwork.
   1. Small area honeycombing less than 1 inch deep may be repaired as described below for exposed form finishes.
   2. Honeycombing in large areas or honeycombing 1 inch deep or greater may not be repaired. Notify the architect immediately after removal of form work. Architect will determine if concrete is to be removed or the method of repair if repair is allowed by architect.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout mixtures will not be allowed.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
      a. Prior to occupancy of building, apply one additional coat of sealer/curing compound.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding or saturated burlap.
   2. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
      b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
      c. Slabs to be left exposed apply one additional coat of sealer prior to occupancy of building.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and the General Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by Architect. The cost of additional testing shall be borne by the General Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Footings: Proportion normal-weight concrete mix as followsa:

1. Compressive Strength (28 Days): 3000 psi.
2. Slump Range: 3 to 5 inches.

B. Slab-on-Grade: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Slump Range: 5 to 7 inches.

C. Concrete Walk/Pad:

1. Compressive Strength (28 Days): 4000 psi.
2. Slump Range: 3 to 5 Inches.
3. Air Entrained.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCES

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2013.

B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

H. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2016.

J. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

K. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

C. Submit color of mortar samples.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA 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.

PART 2 PRODUCTS

2.01 MATERIALS

A. Masonry Cement: ASTM C91, Type S, Type M.
   1. Acceptable product: use one brand throughout job.

B. Portland Cement: ASTM C150, Type II - Moderate; color as required to produce approved color sample.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Pigments for colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness.

   1. Colors: As require to match architect's color samples.

   2. Acceptable product: Use one brand throughout project.

      a. Color pigment Industries, Elgin, IL

      b. Solomon Colors, Springfield, IL

      c. Lone Star

F. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
   1. Acceptable product:
      a. W. R. Grace "Dry Mortar" additive.
      b. BASF "Hydrocide" Powder.

2.02 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.

E. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 50 degrees F.

F. Mortar Proportioning-Masonry Cement Mortar
   1. One part masonry cement and three parts sand

2.03 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.
   1. Ready mixed concrete

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
   1. Site mixed grout

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
   1. Architect's approval required for all admixtures.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with brick or block masonry units. Brace masonry to resist wet grout pressure.

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 48 inches.
   2. Limit height of masonry to 48 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 SCHEDULES

A. Use Type "S" mortar for all masonry above grade.

B. Use Type "M" mortar for all masonry below grade.

C. Use color mortar with moisture resistant additive.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clay Facing Brick.

B. Common Brick.

C. Reinforcement and Anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Brick allowance.

B. Section 03 3000 - Cast in Place Concrete: Reinforcing steel.

C. Section 04 0511 - Masonry Mortaring and Grouting.

D. Section 07 6500 - Flexible Flashing

E. Section 07 9005 - Joint Sealers: Backing rod and sealant at control joints.

F. Section 09 9000 - Painting and Coating: Painting existing brick veneer.

1.03 REFERENCE STANDARDS

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2005.

B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.

C. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

E. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009.

F. ASTM C 62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2005.

G. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2006b.

H. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.

I. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2007a.

J. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

K. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data for fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit 2 samples of facing units to illustrate color, texture, and extremes of color range.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 6' wide x 3' tall; include 3 mortar color options and 3 brick color options.

B. Mock-up may not remain as part of the Work.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 BRICK UNITS

A. Facing Brick: ASTM C 216, Type FBS, Grade SW.

1. Color and Texture: To be selected. Design intent is to match existing masonry.
2. Size: Modular. (2 5/8" x 3 5/8" x 7 5/8")
3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

B. Building (Common) Brick: ASTM C 62, Grade MW; cored units.

1. Size: As indicated on drawings.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and grout: As specified in Section 04 0511.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
1. Dur-O-Wal: www.dur-o-wal.com.
2. Hohmann & Barnard, Inc: www.h-b.com.
3. Masonry Reinforcing Corporation of America: www.wirebond.com.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; uncoated.

C. 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. Anchor plates: Not less than 0.105 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
2. Wire ties: Trapezoidal shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 1-1/4 inches.
4. 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.
5. Wire Bond - Series RJ-711 with 2401 plate and 2402 hook.
6. Screws: 5/16 inch diameter, co-polymer coated, self-drill, self-tap; 2 screws per plate.

2.04 FLASHINGS

A. Through Wall Flashing: Copper fabric as specified in Section 07 6500.

2.05 ACCESSORIES

A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc: www.h-b.com.
      c. Masonry Reinforcing Corporation of America: www.wirebond.com.

B. Tape: Multi-ply polyethylene/polymer-modified asphalt membrane.
   1. Use behind all veneer ties at masonry veneers to stud walls.
   2. 2 inch wide tape; 40 mil thick
   3. Manufacturer: Hohmann & Barnard, Inc., "Textroseal".

C. Joint Filler: Closed cell polyurethane; oversized 50 percent to joint width; self-expanding; width as required x by maximum lengths available.

D. 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: Panels designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products Inc: www.advancedflashing.com.
         2) Mortar Net USA, Ltd: www.mortarnet.com.

E. Weeps Vents: Provide at all weep locations indicated on drawings.
   1. Non-woven mesh with M-notch bottom.
   2. Size: 3/8 inch x 3 ½ inches high x full depth of masonry.
   3. Color to be selected by architect to match mortar color.
   4. Manufacturer: Cavclear Weep Vents as manufactured by Archovation, Inc., PO Box 241 Hudson, WI 54016, (888) 436-2620.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

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. Brick Units:
   1. Bond: Running. Design intent is to match existing masonry.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

D. Minor deviations in location of door or window openings to make work course out will be at the contractor's discretion; major changes must have approval of architect.

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. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar and mortar smears as work progresses.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 WEEPS/CAVITY VENTS

A. Install weeps in walls at 24 inches on center horizontally above through-wall flashing, as indicated on the drawings.

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. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

C. 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.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
   1. 8" o.c. at walls below grade to be filled with concrete

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. 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. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. 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 16 inches on center.

F. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

G. Use adjustable multiple wythe joint reinforcing at masonry veneer to concrete block back-up.

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.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings to within 1/4 inch of exterior face of masonry.

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.10 GROUTED COMPONENTS

A. Place and consolidate grout fill without displacing reinforcing.

3.11 CONTROL JOINTS

A. In general, do not continue horizontal joint reinforcement through control joints. See specific notes on structural drawings.

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.

3.12 BUILT-IN WORK

A. As work progresses, install built-in wood nailing strips, and anchor bolts 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 frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent cores with grout minimum 8 inches from framed opening.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns and Pilasters: 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 Joint Thickness: 1/8 inch in 3 ft.

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, sleeves, and grounds. 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 CLEANING

A. Remove excess mortar and mortar droppings.
B. Replace defective mortar. Match adjacent work.
C. Clean soiled surfaces with cleaning solution.
D. Use non-metallic tools in cleaning operations.
E. Use of acids for cleaning masonry will not be allowed.

3.16 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.17 SCHEDULES

A. Face Brick:
    1. Exterior Veneer and screen wall repair.
B. Common Brick:
    1. Allowed at veneer work below grade.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-load bearing formed steel stud exterior wall framing.
   1. Wind load requirements
   2. Earthquake code requirements; load from veneer

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Veneer masonry supported by wall stud metal framing.

B. Section 06 1000 – Rough Carpentry

C. Section 06 1643 - Gypsum Sheathing: Wall sheathing.

D. Section 07 2116 - Blanket Insulation: insulation within framing members.

E. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 1996, with 2000 supplement.

C. AISI SG03-2 - 2002 edition of the Cold-Formed Steel Design Manual; American Iron and Steel Institute; 2002.

D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2004a.

F. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2004b.

G. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2004a.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2004 and errata.

I. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 1998.

J. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and load tables.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention, and manufacturer's standard details.

E. Shop Drawings:

1. Submit shop drawings showing complete details for fabrication and erection for all light gauge members.
2. Include all components for a complete framing system.
3. Provide templates for installation of all anchorage devices.
4. Submit shop drawings for review prior to starting any work.
5. Shop drawings shall be stamped by an Engineer registered in the State of Arkansas.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum 3 years of experience.

C. Contractor is responsible for design, fabrication and erection of steel stud framing to meet the requirements of the latest adopted Local Code.

D. Compute all structural properties in accordance with AISI "Specifications for the Design of Cold Formed Steel Structural Members."

E. Provide weldments as required in accordance with the American Welding Society (AWS)AWSD.13 "Structural Welding Code-Sheet Steel."

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

B. Coordinate work of this section with the placement of components within the stud framing system.

1.07 SYSTEM DESCRIPTION

A. Design Requirements: The Supplier shall design and/or verify the size & strength of all light gauge cold formed Metal framing members and connections in accordance with The ML/SFA Lightweight Steel Framing Systems Manual.
   1. Design shall use the latest adopted local code for wind and seismic loads.
   2. Interior walls shall be designed for a minimum wind load of 10psf and exterior walls shall be designed for a minimum wind load of 20 psf.
   3. Maximum deflection of all exterior wall systems shall not exceed L/600 for studs backing masonry Veneer and L/360 for studs backing metal panel Veneer.
   4. See drawings for additional minimum requirements for metal stud anchorage at metal building frames and metal building purlins.
   5. See structural drawings for all light gauge floor design requirements.

B. Design shall conform to: AISI Specification for the Design of Cold-Formed Steel Structural members. Wall bridging shall be designed to provide resistance to minor axis bending and wall rotation of wall studs. Designated selected exterior and/or interior walls shall be designed to provide frame stability and lateral load resistance. All connections(member to member, and member to structure) shall be designed and detailed. Allow a minimum of 1 ½" for frame deflection in connections where studs are connected to purlins or rigid frames.

C. Qualification of Field Welding: Qualify welding process and welding operators in accordance with AWS " Standard Qualification Procedure".

D. Minimum Exterior Stud sizes Spaced @ 16" o.c. (1 5/8" min flange width)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. Dietrich Metal Framing: www.dietrichindustries.com.
   2. Clark Steel Framing Systems: www.clarksteel.com
   3. United States Gypsum Company: www.usg.com
   4. Nucon Steel www.nuconsteel.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

C. Maximum Spacing and Layout Requirements: Exterior wall studs shall be spaced at 16 inches on center typical spacing and at 12 inches on center within 6 feet of all building corners.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C 955; studs formed to channel shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Base Metal: Structural Steel (SS), 33 ksi minimum yield strength
   2. Exterior Wall Studs, Minimum Size: See table on structural drawings and 1.07 System Description for minimum sizes.
   3. Galvanized in accordance with ASTM A 653/A 653M G60/Z180 coating.
   4. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.

B. Framing Connectors: Factory-made formed steel sheet, ASTM A 653/A 653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
   1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 18 gage, thickness.

C. Fastening: Members may fastened together by welds, screw fasteners, drilled anchors or power-driven fasteners that fit the particular application.
   1. Securely weld or screw track and studs for fascia, bulkheads, and furr downs to roof framing above to support fascia, bulkheads, and furr downs in tension.
   2. Track attachment to concrete may be by proper use of drilled anchors or power-driven fasteners.
   3. Stud to track connections may be by welds or screw fasteners each side.
   4. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
      a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
      d. Acceptable Products: VertiClip(r) or DriftClip(tm) manufactured by The Steel Network Inc.

5. Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, 16 gauge.06 inch thickness, finish to match framing components.

B. Plates, Gussets, Clips: Formed Sheet Steel, 16 gauge.06 inch thickness; finish to match framing components.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.05 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A 153/A 153M.
   1. Where screw attachment is allowed and detailed on the drawings.

B. Anchorage Devices: Power actuated.

C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements or as detailed on the drawings

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center or weld to structure as detailed on drawings. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center typical and at 12 inches on center within 6 feet of all exterior building corners; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using welding method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Install intermediate studs above and below openings to align with wall stud spacing.

H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

I. Attach cross studs to studs for attachment of fixtures anchored to walls.

J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

K. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Miscellaneous Metals:
   1. Structural shapes for mechanical supports, frames and openings and thru-the-roof supports for mechanical equipment.
   2. Bearing plates for beams and anchors.
   3. Bolts.
   4. Miscellaneous bracing angles and support angles.

B. Mechanical equipment supports

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2002.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2004a.

D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

E. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003.

F. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2004b.

G. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1998.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2004 and errata.

J. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002.

L. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. All fabrication to be completed by a firm regularly engaged in metal fabrications with a minimum of three year's experience.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.
B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
C. Plates: ASTM A 283.
D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
E. Bolts, Nuts, and Washers: galvanized to ASTM A 153/A 153M where connecting galvanized components.
F. Welding Materials: AWS D1.1; type required for materials being welded.
G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 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. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Mechanical Equipment Supports:
   1. Sub-framing for mechanical equipment hangers shall be provided as required.
   2. Unless otherwise detailed on the drawings, this sub-framing shall be 3 inches x 2-1/2 inches x 1/4 inch angles, long leg vertical.
   3. This sub-framing shall be bolted to the structure with 1/2 inch bolts.

2.04 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for galvanized finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Prime Painting: One coat.
E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123/A 123M requirements.
F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements.

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.

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. Field weld components indicated.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 ERECTION 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 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lay-out.

B. Preservative treatment of wood.

C. Miscellaneous wood nailers and furring strips.

1.02 REFERENCE STANDARDS

A. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.

B. AWPA C27 - Plywood -- Fire-Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association; 2005.

D. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

E. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

F. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide technical data on sheathing, wood preservative materials and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
   2. Acceptable Lumber Inspection Agencies: SPIB and WWPA.
   3. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Grading Agency: Western Wood Products Association (WWPA).

C. Sizes: Nominal sizes as indicated on drawings, S4S.

D. Moisture Content: Kiln-dry or MC15.

E. Miscellaneous Framing:
   1. Species: Southern Pine, Western Cedars.
   2. Grade: No. 2.

F. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.

2.03 EXPOSED BOARDS

A. Moisture Content: Kiln-dry (15 percent maximum).

B. Surfacing: S4S.

C. Species: Western Cedar, Southern Pine.

D. Grade: No. 1, 1 Common, or Select.

2.04 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.

B. Preservative Pressure Treatment of Lumber Above Grade: AWPA Use Category UC3B, Commodity Specification A (Treatment C2) using waterborne preservative to 0.25 lb/cu ft retention.
   1. Kiln dry lumber after treatment to maximum moisture content of 12 percent.
   2. Treat lumber in contact with masonry or concrete, or any wood exposed to weather.
   3. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

3.02 BULDING LAY-OUT

A. Lay-out the building using batter boards placed not less than 4'-0" outside of building lines and left in place until all walls are above grade. No excavation shall be started until all lines have been established and dimensions are checked and finish floor elevation is checked by the architect.

B. Carpentry work shall include full responsibility for the accurate laying out of the building and the work of all subcontractors, mechanical and electrical contractors, and to see that their work shall not interfere with the structural parts of the building.

3.03 FRAMING INSTALLATION

A. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.
   1. Attach to walls with screws.

END OF SECTION

SECTION 07 2116
BLANKET INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall construction where detailed.

B. Batt insulation at interior partitions.

C. Miscellaneous batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof, behind structure at exterior walls.

1.02 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing

B. Section 09 2116 – Gypsum Board Assemblies

1.03 REFERENCES

A. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2001.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

C. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Owens Corning, Toledo, Ohio

B. Johns Manville, Denver, Colorado

C. Certain Teed Corporation, Valley Forge, Pennsylvania

2.02 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 450 or less, when tested in accordance with ASTM E 84.
   2. Combustibility: Non-combustible when tested in accordance with ASTM E 136, except for facing, if any.
   3. Provide insulation made without formaldehyde.
   4. Thermal Resistance: See 3.03 Schedules.
   5. Thickness: See 3.03 Schedules.
   6. Facing: Unfaced.
      a. ASTM C 665; Federal Specification HH-1-521F, Type I.
   7. Facing: Kraft faced, one side.
      a. ASTM C 665; Federal Specification HH-1-521F, Type II.
   8. Facing: Foil faced, one side.
      a. ASTM E84:
         1.) Maximum flame spread index: 25
         2.) Maximum smoke development index: 50

PART 3 EXECUTION

3.01 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit 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. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Secure facing flanges in place at maximum 6 inches on center.

G. Tape seal all butt ends, lapped flanges, and tears or cuts in membrane.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.02 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

3.03 SCHEDULES

A. Exterior Walls:
   1. Kraft Faced
      a. 6-1/4 inch thick, R-Value R-19.
   2. Foil Faced
      a. 6-1/4 inch thick, R-Value R-19.
      b. Install foil faced insulation when exposed on exterior walls and concealed locations.

B. Interior Walls:
   1. 3-1/2"

END OF SECTION

SECTION 07 2400
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Class PB composite wall cladding of rigid insulation and applied coating.

1.02 RELATED REQUIREMENTS

A. 06 1636 – Wood Panel Product Sheathing

B. 07 2501 - Weather Resistant Membranes

1.03 REFERENCE STANDARDS

A. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2004a.

B. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2009.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

D. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

E. EIMA 101.86 - Standard Test Method for Resistance of Exterior Insulation and Finish Systems (EIFS), Class PB to the Effects of Rapid Deformation (Impact); 1995, Revised August 1995.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.

C. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.

D. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site at all times during installation.

B. EIFS Manufacturer Qualifications: Provide all EIFS products other than insulation from the same manufacturer with qualifications as follows:
   1. Member in good standing of EIMA (EIFS Industry Members Association).
   2. Manufacturer of EIFS products for not less than 5 years.
   3. Manufacturing facilities ISO 9002 certified.

C. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.

D. Installer Qualifications: Company specializing in EIFS work, with not less than 3 years of documented experience, and approved by the EIFS manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.

B. Storage: Protect adhesives and finish materials from freezing and temperatures in excess of 90 degrees F.
   1. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

2. Protect insulation materials from exposure to sunlight.

1.07 FIELD CONDITIONS

A. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.

B. Do not install finish or sealants when ambient temperature is below 40 degrees F.

C. Do not leave installed insulation board exposed to sunlight.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. "Outsulation MD System" as manufactured by Dryvit Systems, Inc., Warwick, RI.

B. "STO Classic System" as manufactured by STO Corporation, Atlanta, GA.

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

2.03 MATERIALS

2.04 CLASS PB SYSTEM

A. Exterior Insulation and Finish System: Synthetic base and finish coatings with fiberglass reinforcing mesh, over mechanically-fastened expanded polystyrene board insulation; complying with performance requirements of EIMA Class PB system.
   1. Wind Loading: Withstand minimum positive and negative pressure of 90 psf, per ASTM E 330.
   2. Impact Resistance: Construct system to provide impact resistance when tested per EIMA 101.86:
      a. Standard: 25 in-lb, for areas inaccessible to public.
      b. High impact resistance to 40 in-lb to be used to 6'-0" above grade

B. Base Coat: Fiber-reinforced, acrylic or polymer-based product that is compatible with insulation board and reinforcing mesh.

C. Finish Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
   1. Texture: Medium.
   2. Color: As selected from manufacturer's range of standard colors.
   3. Mildew Resistant: "PMR"

D. Board Insulation: Expanded polystyrene board; ASTM C 578, Type I; with the following characteristics:
   1. Board Size: 24 by 48 inches.
   2. Board Size Tolerance: +/- 1/16 inch from square and dimension.
   3. Board Thickness: As indicated on drawings.
   4. Thickness Tolerance: +/- 1/16 inch maximum.
   5. Board Edges: Square.
   6. Thermal Resistance (R factor per 1 in (25.4 mm) at 75 degrees F; R-5 3.60.
   7. Compressive Resistance:
      a. 25 psi; standard
      b. 40 psi; high impact
   8. Surface Burning Characteristics: Flame spread/Smoke developed index of 5/65, when tested in accordance with ASTM E 84.
   9. Manufacturers:
      a. Owens-Corning.
      b. Dow Chemical Company.

E. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.

F. Insulation Board Closure Blocks: Expanded Polystyrene meeting Dryvit Specification for Insulation Board, DS131. The Closure Blocks shall measure a minimum of 6 inches in height.

G. Dryvit Starter Strip
   1. (2 in x 6 in x 4 ft) piece of aged expanded polystyrene configured to receive the Dryvit Track and Vent Track. It is required at the base of all walls and at base of horizontal terminations.

H. Dryvit Vent Assembly:
   1. A (2 in x 6 in x 12 in) piece of aged expanded polystyrene, which is configured to contain a formed aggregate matrix material and receive the Dryvit Vent Track. It is required at the base of walls and the base of horizontal terminations and is capable of draining water.

I. Dryvit AP Adhesive: A moisture cure urethane-based adhesive used to attach the Dryvit Track and Vent Track to the Backstop NT.

J. Dryvit Track:
   1. A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 located above the Dryvit Starter Strip

K. Dryvit Vent Track:
   1. A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 containing a slot for drainage and located above the Dryvit Vent Assembly, along the base of walls and horizontal terminations.

2.05 ACCESSORIES

A. Insulation Adhesive: Type recommended by EIFS manufacturer for project substrate.

B. Insulation Fasteners: Fastener and plate system appropriate for substrate and as recommended by EIFS manufacturer.

C. Flashing: As specified in Section 07 6200.

D. Sealant Materials: As recommended by EIFS manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is sound and free of oil, loose materials, or protrusions that could interfere with EIFS installation and is of a type that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are thoroughly dry.

B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

3.02 PREPARATION

A. Apply primer to substrate as recommended by EIFS manufacturer for project conditions.

3.03 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions and requirements and recommendations of ASTM C 1397.

B. Accessories: Install starter track, back-wrap mesh or edge-wrap mesh at system terminations and other accessories as recommended by EIFS manufacturer, assuring that track is level and securely fastened.

3.04 INSTALLATION - INSULATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.

C. On wall surfaces, install boards horizontally. On horizontal surfaces, install boards perpendicular to framing.

D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.

E. Rasp irregularities off installed insulation board.

F. Mechanical Fastening: Space fasteners as recommended by EIFS manufacturer.

G. Adhesive Attachment: Use method recommended by EIFS manufacturer.

3.05 INSTALLATION - CLASS PB SYSTEM

A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at all terminations of the EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
   1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
   2. Allow base coat to dry a minimum of 24 hours before next coating application.
   3. Recommended method is to apply base coat in two (2) passes.

B. Install expansion joints at floorlines as recommended by EIFS manufacturer.

C. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.

D. Finish Coat Thickness: As recommended by manufacturer.

E. Apply sealant at finish perimeter and expansion joints in accordance with Section 07 9005.

3.06 CLEANING AND PROTECTION

A. Do not permit finish surface to become soiled or damaged.

B. Remove excess and waste EIFS materials from project site.

C. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

END OF SECTION

SECTION 07 2501
WEATHER RESISTANT MEMBRANES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Weather resistant membranes for light commercial buildings (Building Wrap).

B. Seam Tape

C. Flashings

1.02 RELATED SECTIONS

A. Section 06 1000 – Rough Carpentry

B. Section 06 1636 - Wood Panel Product Systems.

C. Section 07 2400 - Exterior Insulation and Finish Systems.

1.03 REFERENCES

A. ASTM C920 – Standard Specification for Elastomeric Joint Sealants; 2014a

B. ASTM C 1193 – Standard Guide for Use of Joint Sealants; 2016

C. ASTM D 882 – Test Method for Tensile Properties of Thin Plastic Sheeting; 2012

D. ASTM D 1117 – Standard Guide for Evaluating Non-woven Fabrics; 2014

E. ASTM E 84 – Test Method for Surgace Burning Characteristics of Building Materials; 2016

F. ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials; 2016

G. ASTM E 1677 – Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls; 2011

H. ASTM E2178 – Test Method for Air Permeance of Building Materials; 2013

I. ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011

J. AATCC - Test Method 127 Water Resistance: Hydrostatic Pressure Test.

1.04 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Test Results: Submit copies of test results showing performance characteristics equaling or exceeding those specified.

C. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Qualifications
   1. Installer shall have experience with installation of weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with weather barrier manufacture's installation guidelines and recommendations.
   3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

B. Mock-up.
   1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
      a. Mock-up size: 10 feet by 10 feet
      b. Mock-up substrate: Match wall assembly construction including window opening.

c. Mock-up may remain as part of the work.

2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to preform required mock-up visual inspection and analysis as required for warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. "Tyvek", "Commercialwrap". Dupont Company, Wilmington, DE.
   2. "Tyvek", "Commercialwrap D". Dupont Company, Wilmington, DE.

B. Provide all weather resistant membranes from a single manufacturer.

2.02 MATERIALS

A. A. Tyvek® Water Resistant Barrier: Spunbonded olefin, nonwoven, non-perforated:
   1. Classification: ASTM E 1677, Type I, air leakage of 25 mph wind pressure less than 0.06 cubic feet per minute per square foot.
   2. Water Vapor Transmission: Greater than 20 perms, when tested in accordance with ASTM E 96 Procedure B.
   3. Water Penetration Resistance: Minimum 78.7 inches per AATCC Test Method 127.

2.03 MATERIALS

A. Sealing Tape: DuPont Contractor Tape.

B. Fasteners:
   1. Steel Framing: Rust-resistant screws with washers.

C. Flashing Tape: Dupont Tyvek "Flexwrap" or "Straight Flash".

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.02 INSTALLATION

A. Install weather resistant membranes in accordance with manufacturer's instructions over exterior sheathing.
   1. Create a complete wall wrap system.

B. Seal joints and penetrations through weather resistant membranes with tape and fasteners before installation of finish material.

C. Ensure that weather resistant membranes are air tight, free from holes, tears, and punctures.

D. Tape all window and door penetrations in accordance with manufacturer's instructions.
   1. Use "Flexwrap" per manufacturer's instructions; odd or custom shapes.
   2. Use "straight flash" per manufacturer's instructions; square shapes.

3.03 SCHEDULE

A. Use "Commercialwrap" behind brick veneer and metal panels.

B. Use "Commercialwrap D" behind exterior insulation and finish system (EIFS).

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior walls.

1.02 RELATED SECTIONS

A. Section 07 6200 - Sheet Metal Flashing and Trim

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

C. Samples: Submit two samples of wall panel 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum five (5) years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 PROJECT CONDITIONS

A. Coordinate the Work with installation of roofing components and soffit materials.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer to provide 20 year non-prorated finish warranty.

C. Installer to provide two year warranty for water tightness and integrity of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pac-Clad; www.pac-clad.com: "Pac Precision Series" (HWPC) Horizontal Wall panel - (Type 1)

B. American Building Company. www.americanbuildings.com : "Architectural III".- (Type 2)

C. Other Acceptable Manufacturers.
   1. Firestone, Una-Clad, Firestone Metal Products, Anoka, MN.
   2. Morin, A Kingspan Group Company, Bristol, CT.

3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Preformed and prefinished metal panel system; site assembled.

B. Materials - Wall Panels
   1. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, SS Grade 80/550, with G90/Z275 Coating. 24 gauge. (26 guage for wall panel - Type 2)
   2. Kynar 500 finish; Premium "metallic" to be determined
   3. Galvalume finish for wall panel - (Type 2)
   4 Panels to be at a length as to avoid end-to-end joints.
   5. Provide factory applied strippable plastic film for protection during fabrication and installation.

2.03 FABRICATION - WALL PANELS - (Type 1)

A. Siding: Minimum 24 ga. standard profile, 7/8 inch deep, lapped edges fitted with continuous gaskets.
   1. Standard Profile: Corrugated 4" rib profile, spaced 12' o.c.
   2. Flashings, Closure Pieces, Sill Flashing: Same material and finish as adjacent materials, profile to suit system.
   3. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

B. Clips: Provide clips for clip installation

2.04 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.

C. Fasteners: Manufacturer's standard concealed fastening system: Clip Leg (HWPC) system

D. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that exterior wall assembly is ready to receive panels.

3.02 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Fasten panels to sheathing; aligned, level, and plumb.

C. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 5410
MEMBRANE ROOFING – TPO REPAIR

PART 1 GENERAL

1.01 SUMMARY

A. Existing Roof is currently under roof warranty:
   1. Warranty No.: 700440720
   2. Project No.: 4389436
   3. 20 year warranty starting May 26, 2023
   4. Elevate Roofing products
   5. Installer: Jonesboro Roofing Co., Inc.

B. Patch and repair existing elastomeric sheet roofing system, including:
   1. Roofing manufacturer's requirements for the specified warranty.
   2. Preparation of roofing substrates.
   3. Wood nailers for roofing attachment.
   4. Insulation.
   5. Elastomeric membrane roofing.
   6. Metal roof edging and copings.
   7. Flashings.
   8. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

D. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.02 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry

1.03 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

B. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2004.

C. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2004.

D. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 2003.

E. ASTM D 1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2003.

F. ASTM D 1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2005a.

G. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2003.

H. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2003.

I. PS 1 - Construction and Industrial Plywood; 1995.

J. PS 20 - American Softwood Lumber Standard; 2005.

1.04 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in the section.

B. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC S770.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for Submittal Procedures

B. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include at least the following:
      a. Technical data sheet for roof membrane.
   2. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

C. Samples: Submit samples of at least the following:
   1. Sample of roof membrane.

D. Specimen Warranty: Submit prior to starting work.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

G. Executed Warranty.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Roofing installer shall have the following:
   1. Current Firestone Master Contractor status.
   2. Fully staffed office within 100 miles of the job site.
   3. At least five years experience in installing specified system.
   4. Capability to provide payment and performance bond to building owner.

1.07 PRE-INSTALLATON MEETING

A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
   1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
   2. Notify Brackett/Krennerich Architects well in advance of meeting.

B. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.09 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Installer's Warranty
   1. Terms: Upon completion of all work and as a condition of its acceptance, deliver to the owner a written guarantee signed by the General Contractor and / or the installing subcontractor agreeing to correct all leaks and defects in the roofing system work to the satisfaction of the owner and the manufacturer of the installed roof system. Installer's warranty to be issued on Company's printed letterhead.
   2. Time Period: The time period for correction for the roofing system work shall be two (2) years from the date of final acceptance of the roof by the Owner. Sixty (60) days before the end of the two year period, review roof conditions on the site with the owner and all parties concerned and correct all defects in conformance with specifications.
   3. Warranty Repairs: During the correction of work period, the roofing installer shall upon notice of the owner, make immediate temporary repairs and notify the roofing materials manufacturer, a report made, and, if covered by this guarantee or the roofing manufacturer's guarantee, the roof shall be permanently restored to a watertight condition, all at no cost to the owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System: Firestone Building Products Co., Carmel, IN. www.firestonebpco.com.
   1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
      a. Specializing in manufacturing the roofing system to be provided.
      b. Minimum ten years of experience manufacturing the roofing system to be provided.
      c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
      d. ISO 9002 certified.
      e. Able to provide isocyanurate insulation that is produced in own facilities.
      f. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
   1. Metal roof edging products by other manufacturers are not acceptable.
   2. Field- or shop-fabricated metal roof edgings are acceptable, only if they are covered under the terms and conditions of the low slope roofing system warranty.

D. Substitution Procedures: See Section 01 6000 - Product Requirements
   1. Submit evidence that the proposed substitution complies with the specified requirements.

2.02 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Match Existing

2.03 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

B. See Section 06 1000.

PART 3 INSTALLATION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.04 INSULATION BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

F. Foam Adhesive Fastening: Adhere insulation to concrete deck per membrane manufacturer's recommendations.

3.05 SINGLE-PLY MEMBRANE INSTALLATION - FULLY ADHERED SYSTEM

A. Place Membrane and Allow to Relax:

Place membrane panel, without stretching, over the acceptable substrate and allow to relax for a minimum of 30 minutes before splicing or attaching. The Firestone UltraPly TPO Adhered System must be installed so that the seams shed the flow of water.

B. Fold the Membrane Back:

After making sure the sheet is placed in its final position allowing for the minimum lap width per Firestone specifications, fold it back evenly onto itself without wrinkles to expose the underside mating surface of the sheet.

C. Remove Dusting Agent and Dirt:

Sweep the mating surfaces with a stiff broom to remove any dusting agent or dirt that may have accumulated.

D. Apply the Bonding Adhesive:

Apply bonding adhesive with either a 9" (228mm) wide solvent-resistant paint roller or a commercial-grade adhesive sprayer. Adhesive must be applied in a relatively uniform thickness to both surfaces at approximately the same time. If adhesive is spray-applied, it must be back-rolled with a paint roller to assure proper contact and coverage. Refer to Firestone Technical Information Sheets and container labels for specific application instructions.

E. Stop Bonding Adhesive Short of Seam Area:

Care must be taken not to apply bonding adhesive over an area that is to be later spliced to another sheet or flashing. All bonding adhesive must be completely removed from the seam area.

F. Apply Bonding Adhesive at Specified Coverage Rate:

Refer to the container label and Technical Information Sheet for specific application requirements and coverage rates.

G. Test Bonding Adhesive for Readiness (Touch-Push Test):

Allow the bonding adhesive to flash-off. Touch the adhesive surface in the thickest area with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted, the adhesive is not ready for mating. Flash-off time will vary depending on ambient conditions.

H. Bond the Membrane to the Substrate:

Starting at the fold, roll the previously coated portion of the membrane into the coated substrate slowly and evenly to minimize wrinkles.

I. Broom the Membrane:

To assure proper contact, compress the bonded half of the membrane to the substrate with a stiff push broom.

J. Repeat Procedure to Complete the Membrane Installation:

Fold the un-adhered half of the membrane back onto itself, and repeat the procedure.

K. Splice the Lap:

Splice the outside edge of the top sheet as specified in per-manufacturer's specifications.

3.06 MEMBRANE SEAMING

A. Clean the Lap Splice Area:

Using a clean white cotton rag dampened with Firestone SW-100 (Splice Wash), thoroughly clean an area on both sheets at least 6 inches (15.24 cm) wide if seam area has become contaminated with dirt, debris, moisture, etc. Membrane left exposed for more than 12 hours must be cleaned prior to any welding activity.

B. Hot Air Weld Lap Splices:

1. Horizontal field splices:
   Whenever possible, all field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. (Refer to the welding equipment requirements in the Technical Information Sheets for minimum requirements. For specifics, consult the welder manufacturer's data sheets).
2. Seam width requirements: (Standard TPO and PCV Systems)
   Seams made with the automatic welder must be a minimum of 1-1/2" (38.1 mm) wide. Seams made with hand welders must be a minimum of 2" (50.8 mm) wide. Use silicone hand rollers to assure proper mating of surfaces as hand heat welding proceeds.
3. Vertical field splices:
   Hand held welders can only be used on vertical welds or where an automatic welder is not practical or cannot be used.

C. Equipment and Test Splice Requirements:

In accordance with manufacturer's printed instructions.

D. Seam Inspection:

Probe all completed welds using a slotted screwdriver or dull cotter pin puller type tool to verify seam integrity daily. Do not probe welds until they have had time to cool. Any welds found to be insufficiently welded need to be repaired on a daily basis.

E. T-Join Patches:

T-joint patches must be installed at all intersections of field seams if .060" (1.52 mm) or thicker membrane is used. Refer to Lap Splice Detail Section of the manufacturer.

F. Cut Edge Sealing (UltraPly TPO specific):

All cut edges with scrim exposed must be sealed with Firestone UltraPly TPO Cut Edge Sealant.

G. NOTE: SOLVENT WELDING IS NOT ACCEPTABLE

3.07 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.

C. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

E. Roof Drains:
   1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
   2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
   3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
   5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.

1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

3.08 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.09 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 6500
FLEXIBLE FLASHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laminated metal flashings and counter flashings.
   1. Through wall flashing at masonry

1.02 RELATED SECTIONS

A. Section 04 2000 - Unit Masonry.

1.03 REFERENCES

A. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets showing product characteristics and including installation instructions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company with at least five years of successful experience in weathertight installation of flashing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's sealed containers and packaging, bearing manufacturer's name and product identification.

B. Stack flashing materials to avoid twisting, bending, and abrasion. Protect materials from weather before installation.

C. Store mastic materials in sealed containers under cover.

1.07 WARRANTY

A. To be warranted to be free of defects in manufacture for five (5) years. Material will be provided at no charge to replace any defective product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Sandell Manufacturing Company, Inc; 310 Wayto Rd., Schenectady, NY 12303. ASD. Tel: (518) 357-9757. Fax: (518) 357 9636.

2.02 MATERIALS

A. Flexible Flashing: Copper fabric flashing; laminated sheet comprised of copper sheet, asphalt mastic coated on both sides, bonded under pressure between two layers of asphalt saturated, woven glass fabric.
   1. Copper weight: 5 oz/sq ft.
   2. Size: 18" x 25'-0"

B. Mastic: Cut-back asphalt containing long fibered material, in trowel grade consistency.
   1. Sandell's Trowel Mastic

2.03 ACCESSORIES

A. Termination Bar:
   1. Provide metal termination bar at top of flashing at attachment of flexible flashing to sheathing.

2.04 FABRICATION

A. Forming: Fabricate flashings true to shape and accurate in dimension. Form pieces in longest possible lengths to minimize joints. Fold flashing at corners and at ends of pans instead of cutting.

B. Joints: Provide not less than 4 inches of overlap at flashing joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to receive flashing are thoroughly dry, free from loose materials, and reasonably smooth, with no sharp edges or projections.

3.02 INSTALLATION

A. General: Comply with recommendations of SMACNA Architectural Sheet Metal Manual.
   1. Lap joints minimum of 4 inches and seal watertight with mastic.
   2. Carry flashing vertically as detailed, but not less than 8 inches above horizontal plane
   3. Extend head and sill flashings not less than 6 inches beyond edges of openings and turn up to form watertight pan; seal with mastic.

B. Coordination: Interface flashing work with adjacent and adjoining work to ensure best possible weather resistance and durability of completed flashing.

C. Masonry Flashing: Comply with requirements of sections where masonry installation is specified.

D. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
   1. Carry flashing through wall and leave exposed for inspection.
   2. After inspection, cut flashing flush with surface of masonry.
   3. Remove mortar or other obstructions from weep holes at flashing locations.
   4. Flashing around corners to be continuous.
   5. Spandrel and Shelf Angles: Entire faces to be flashed.
   6. Sills: Place through wall flashing under all sills and from end dam at all terminations to form a continuous water deterrent seal.
   7. Flashing at Vertical Supports: When application requires puncturing or slitting, make sure all openings in the flashing are tightly sealed and that that flashing is terminated onto the supports with mastic.
   8. Weep Holes: In order to properly drain any water collected from properly applied flashing, weep holes must be provided immediately above the flashing at all flashing locations. In general, weep holes should be ¼" diameter, and should be spaced no further than 24" horizontally.
   9. Cleaning of all Excess Mortar: It is also necessary to clean out all excess mortar that may have dropped onto the flashing to ensure clear passage way for water to drain off flashing to the weep holes and out the exterior of the wall.

E. Installing Flashing: Thru wall flashing membrane is installed at locations requiring flashing to channel water out of cavity wall system through weep holes. If exterior drip edge is required terminate flashing 1" on stainless drip edge. Thru Wall Flashing is installed on base of walls, spandrel beams, ledges, window and door headers and other penetrations/interruptions of wall system. Use of drip edge is strongly recommended where flashing is being installed over a bridge course (to avoid efflorescence) or over concrete masonry (to avoid leaving CMU's holes exposed).

END OF SECTION

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Hollow gaskets.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C 510 - Standard Test Method for Staining and Color Change of Single or Multicomponent Joint Sealers

B. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cuclick Movement (Hockman Cycle).

C. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

D. ASTM C834 - Standard Specification for Latex Sealants; 2010.

E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.

F. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005.

G. ASTM D 1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2000.

H. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1997.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal requirements.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1. Install only when atmosphere temperature or joint surface temperature is above 40 degrees F.

1.07 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a three year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sealants
   1. Tremco, Sealant/Weatherproofing Division, Beachwood, Ohio. www.tremcosealants.com
   2. Dow Corning Corporation, Midland, Michigan
   3. Degussa Building Systems/Sonneborn; www.chemrex.com
   4. Bostik, Inc.; www.bostik-us.com
   5. Pecora Corporation; www.pecora.com

2.02 SEALANTS

A. Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
   1. Color: Standard colors matching finished surfaces.
   2. Product: Vulkem manufactured by Tremco.
   3. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Joints between food service equipment and surrounding construction.

B. Type B - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Product: Butyl Sealant manufactured by Tremco.
   2. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.

C. Type C - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: Standard colors matching finished surfaces.
   2. Product: Trademate manufactured by Dow Corning.

D. Type D - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
   1. Color: Gray.
   2. Product: Sonolastic SL-1 manufactured by Sonneborn.
   3. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width; "Rescor" manufactured by W. R. Meadows.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Sealant System Backing: "Backer-Rod" as manufactured by W. R. Meadows.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

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. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Apply caulking compound with hand gun having proper sized nozzles to fit joints and with sufficient pressure to completely fill voids and joints.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

3.06 SCHEDULE

A. Control and Expansion Joints in Paving: Type D.

B. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type A.

C. Lap Joints in Exterior Sheet Metal Work: Type B.

D. Under Exterior Door Thresholds: Type B.

E. Interior Joints for Which No Other Sealant is Indicated: Type C; colors as selected.

F. Any location not listed: According to manufacturer's recommendations.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior Metal stud wall framing.

B. Gypsum Board Ceilings: Non-rated.

C. Gypsum Board Walls: Non-rated.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: For exterior metal studs.

B. Section 06 1000 - Rough Carpentry: Wood blocking for support of wall-mounted equipment.

C. Section 07 2116 - Blanket Insulation: Exterior and interior wall insulation.

D. Section 09 2226 – Gypsum Board Suspension System.

E. Section 09 9000 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002.

B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2004a.

C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2004.

D. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2004a.

E. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2004.

F. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2009.

G. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2004.

H. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2003.

I. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Provide recommendations for expansion/control joints to meet manufacturer's requirements.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
   1. Maintain one copy of standards at project site.

B. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 3 years of documented experience.

PART 2 PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clark Steel Framing Systems: www.clarksteel.com.
   2. Dietrich Metal Framing: www.dietrichindustries.com.

3. United States Gypsum Company.www.usg.com

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

C. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: "C" shaped with knurled faces.
   2. Runners: U shaped, sized to match studs.

D. Furring hat-shaped channels: 7/8"; furring channels; 18 gauge.

E. Z-Shaped Furring Channels: 1 ½"; furring channels; 18 gauge.

F. Framing Schedule
   1. Exterior Walls: See Section 05 4000 - Cold Form Metal Framing
   2. Interior Partitions: (and misc. framing)
      a. 2 ½", 3-5/8", 4", 6", 8" 22 gauge galvanized studs
      b. 2 ½", 3-5/8", 4", 6", 8" 18 gauge galvanized runners

2.02 GYPSUM BOARD MATERIALS

A. Manufacturers:
   1. G-P Gypsum Corporation: www.gp.com/gypsum.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. USG: www.usg.com.
   4. CertainTeed Gypsum: www.certainteed.com/gypsum.

B. Gypsum Wallboard: ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
   1. Regular Type:
      a. Application: Use for vertical surfaces, unless otherwise indicated.
      b. Thickness: 5/8 inch, as indicated.
      c. Edges: Tapered.
   2. Type X or Type C: Fire resistant, UL or WH rated.
      a. Application: Where required for fire-rated assemblies, unless otherwise indicated.
      b. Thickness: 5/8 inch
      c. Edges: Tapered.
      d. Shaft wall: 1 inch thick liner panel.
   3. Water-Resistant Gypsum Board: ASTM C 1396/C 1396M; ends square cut.
      a. Application: at all vertical surfaces at toilets, janitor closets, areas with a lavatory, and mechanical rooms unless noted otherwise.
      b. Type: Type X
      c. Thickness: 5/8 inch
      d. Edges: tapered

2.03 ACCESSORIES

A. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

B. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.

C. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.
   1. 1" type S bugle head for single layer of 5/8" gypsum board to metal studs.
   2. 1-5/8" type S bugle head for 2 layers of gypsum board to metal studs.

D. Adhesive for Multi-Layer Partitions: USG Durbond joint compound or USG ready mix joint compound for multi-layer partitions.

E. Expansion/control joints: Zinc control joint No. 093

F. Edge trim: Install at locations where gypsum board abuts dissimilar materials.

1. Edge trim to be:

a. 200 – B metal trim with L-shaped channel by "Sheetrock"

b. #200 – A metal U trim with U-shaped channel by "Clark Dietrich"

c. Edge of gyp board to be finished by way of feathering joint compound to required finish as scheduled.

d. 401/402 (J stop) metal trim by "Sheetrock" – will not be allowed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.
1. All framing components shall be cut squarely for attachment to perpendicular members, or as required for angular fit against abutting members. Members shall be held positively in place until properly fastened.
2. Studs shall be plumbed, aligned, and securely attached to each side of the flange or web at the top and bottom tracks.
3. Splices in studs shall not be permitted.
4. Jack studs shall be installed below window sills, above window and door headers, at free standing stair rails, and elsewhere to furnish structural support and shall be securely attached to supporting members.
5. Wall stud bridging shall be installed as per manufacturer's recommendations.
6. Attach steel runner at floor at all exterior and interior partitions with hardened steel studs. Place studs with open side facing in same direction. Attach studs to runners per manufacturer's instructions.

B. Studs: Space studs at 16 inches on center.
1. Extend partition framing to structure where indicated and brace all partitions to structure.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, toilet accessories, and hardware. Comply with Section 06 6100 for wood blocking.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. 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.

B. See section 07 2116 for insulation.

3.04 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints.

B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.

C. Installation on Metal Framing: Use screws for attachment of all gypsum board.

D. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

3.05 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.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed all-purpose joint compound and finished with ready-mixed all-purpose joint compound.

B. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.

C. 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.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 FINISH LEVEL SCHEDULE

A. Level 5: All walls and ceilings
   1. ASTM C840, GA214; Level 5 finish
      a. Tape in joint compound at joints and interior angles.
      b. Three (3) separate coats of compound at joints, angles, fasteners, and accessories. Compound shall be smooth and free of tool marks and ridges.
      c. Final skim coat of compound over entire surface of gypsum board.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

B. Section 23 3700 - Air Inlets and Outlets: Air diffusion devices in ceiling.

C. Section 26 0548 - Vibration and Seismic Controls: For seismic connections to ceiling system.

C. Section 26 5000 - Interior Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C 423 - Standard Text Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2009b.

C. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2004.

D. ASTM D 3273 - Standard Test Method for Resistance to Growth Mold on the Surface of Interior Coatings in an Environmental Chamber.

E. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 2002.

F. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998.

G. ASTM E 1477 - Standard Test Method for Luminous Reflectance factor of Acoustical Materials by Use of Integrating -Sphere Reflectometers

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 4 x 4 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures.

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 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.07 PROJECT CONDITIONS

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. Install acoustical units after interior wet work is dry.

1.08 EXTRA MATERIALS

A. Provide 5 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project. This includes both Type "A" and Type "B" units.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc; Product Fine Fissured, www.armstrong.com.
   2. BPB Celotex; Product Capaul: www.bpb-na.com.
   3. USG: www.usg.com.
   4. Certain Teed Ceilings: www.certainteed.com

B. Acoustical Units - General: ASTM E1264, Class A.

C. Acoustical Panels Type A: Painted mineral fiber, ASTM E 1264 Type III, with the following characteristics:
   1. Size: 24 x 48 inches.
   2. Thickness: 15/16 inches.
   3. Composition: Wet formed.
   4. Light Reflectance: 82 percent, determined as specified in ASTM E1264.
   5. NRC: 0.55, determined as specified in ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
   7. Edge: Square.
   8. Surface Color: White.
   9. Surface Pattern: Non-directional fissured.
   10. Performance: No visible sag under conditions not to exceed 90 degrees F. and 90 percent humidity.
   11. Product: "Fine Fissured", product 1729 by Armstrong.

D. Acoustical Panels Type B: painted mineral fiber, ASTM E 1264 Type IV, with the following characteristics:
   1. Size: 24 x 48 inches and 24 x 24 inches.
   2. Thickness: 3/4 inches.
   3. Composition: Wet formed.
   4. Light Reflectance: 88 percent, determined as specified in ASTM E1264.
   5. NRC Range: 0.75, determined as specified in ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
   7. Edge: Beveled Tegular.
   8. Surface Color: White.
   9. Surface Pattern: Smooth.
   10. Product: Ultima Tegular 1915 by Armstrong

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Same as for acoustical units.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.

C. Exposed Steel Suspension System Type 1: Formed galvanized steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; Double flange, for square edge panels, 15/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.
   4. Product: Prelude XL, 7301 by Armstrong.
   5. Size: 24 inches x 24 inches.

D. **Design intent is to match existing suspension system.**

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

D. Provide hold down clips at ceiling tiles at entry foyers/vestibules.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Suspended acoustical ceiling systems shall be installed in accordance with the provisions of ASTM C635 and ASTM C636, earthquake resistant bracing/tying.
   1. Note: All suspended ceiling grid to be supported in accordance with ASTM Design E 580-78 (R84) for Zone 3, seismic; see detail on drawings. IBC code, category D, site classification C.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Locate system on room axis according to reflected plan.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. 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.

G. 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.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

2. Overlap and rivet corners.

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 units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 10 ft of an exterior door.

3.04 ERECTION 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.

3.05 SCHEDULE

A. Typical 24" x 48" ceiling scheduled as "Acoustical Ceiling System – Type 'A'"
   1. Acoustical panels: Type A
   2. Suspension grid: Type 1

B. Moisture resistive 24" x 48" ceiling scheduled as "Acoustical Ceiling System – Type 'B'"
   1. Acoustical panels: Type B
   2. Suspension grid: Type 1

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so 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. Floors, unless specifically so indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

F. See Schedule - Surfaces to be finished, at end of Section.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 – Metal Fabrications: Shop Primed Items.

B. Section 09 2116 – Gypsum Board Assemblies

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.

1.04 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

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 exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Farrell-Calhoun; http://www.farrellcalhoun.com
2. Sherwin Williams; www.sherwinwilliams.com
3. Approved Equals

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings 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 coating material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
1. Provide coatings 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.

D. All materials to be first line, best quality, of the manufacturer.

E. Chemical Content: The following compounds are prohibited:
1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

2.03 PAINT SYSTEMS - EXTERIOR

A. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer:
a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
b. FC Tuff-Boy Rust-Stop Primer 1022 (White)
2. Gloss: Two coats of alkyd enamel:
a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White

b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

B. Ferrous Metals, Primed, Alkyd, 3 Coat:
   1. a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
      b. FC Tuff-Boy Rust-Stop White Primer 1022.
   2. Gloss: Two coats of alkyd enamel:
      a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
      b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

C. Galvanized Metals, Alkyd, 3 Coat:
   1. a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
      b. FC 100% Acrylic All Purpose Metal DTM Primer 5-56.
   2. Gloss: Two coats of alkyd enamel:
      a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
      b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

2.04 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer:
      a. SW Preprite Classic Latex Primer
      b. FC 100% Acrylic Enamel Undercoater 699.
   2. Semi-gloss: Two coats of latex enamel:
      a. SW Proclassic, Waterborne Acrylic Satin, Series B20.
      b. FC 100% Acrylic Interior Semi-Gloss Latex Enamel 600 Line

B. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer:
      a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
      b. FC Tuff-Boy Rust-Stop Primer 1022 (White), 1025 (Red), or 1069 (Gray).
   2. Gloss: Two coats of alkyd enamel:
      a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
      b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

C. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. a. W Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
      b. FC Tuff-Boy Rust-Stop White Primer 1022.
   2. Gloss: Two coats of alkyd enamel:
      a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
      b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

D. Gypsum Board, Acrylic, 3 Coat:
   1. One coat of primer sealer:
      a. SW Preprite Classic Latex Wall Primer; mix block filler to provide slight texture.
      b. FC Perfik-Seal Interior Latex Primer/Sealer 380
   2. Satin: Two coats:
      a. SW Duration Interior Latex Semi-Gloss.
      b. FC 100% Acrylic Interior Semi-Gloss Latex Enamel 600 Line

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating 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 surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

G. Uncorroded Uncoated Steel and Iron Surfaces to be painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

H. Shop-Primed Steel Surfaces to be Finish Painted: 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.

I. Interior 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.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

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.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Use paint systems defined for the substrates to be finished.

B. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.

3.05 FIELD QUALITY CONTROL

A. The painting contractor shall be responsible for any damage done to the work of other contractors, repairing same to the satisfaction of the architect. At the completion of work, this contractor shall clean off all paint spots, oil, and stain from floors, woodwork, glass, hardware, etc., and leave the entire building in satisfactory condition as far as his work is concerned.

B. All work shall be performed by skilled mechanics. Provide drop clothes and protections for all surfaces not to be painted. All paints, stains, varnishes, and other finishes shall be evenly spread and flowed on and shall be free of runs, sags, and other defects. Each coat shall be thoroughly dry before applying succeeding coats. To product smooth and even finishes, all enamel or varnish applied to wood or metals shall be sanded between coats with fine sand paper. No exterior painting will be allowed during rainy, damp, or freezing weather. No interior painting will be permitted when temperature is below 50 degrees F. No painting will be permitted until all surfaces to be painted are dry.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. Fire rating labels, equipment serial number and capacity labels.
   3. Stainless steel items.

B. Paint the surfaces described below under Schedule - Paint Systems and as indicated in the Finish Schedule on the drawings.

C. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

D. Paint existing mechanical ceiling diffusers in Circuit Courtroom 308.

3.08 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish all surfaces exposed to view.

B. Wood: Finish all surfaces exposed to view.

C. Steel Fabrications: Finish all surfaces exposed to view.

D. Galvanized Steel: Finish all surfaces exposed to view.

E. Shop-Primed Metal Items: Finish all surfaces exposed to view.
   1. Finish the following items.

3.09 SCHEDULE - COLORS

A. A complete Color Schedule will be issued by the architect.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for paving and site structures.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Grading.

B. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to no greater than the angle of repose or unless shored to meet OSHA Requirements.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Remove excavated material that is unsuitable for re-use from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural fill for fence posts.

B. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

C. Backfilling and compacting for utilities outside the building to utility main connections.

D. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2009

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2006.

C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)) 2007.

D. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2007.

E. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)/; 2005.

G. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.03 DEFINITIONS

A. Finish Grade Elevations: indicated on drawings.

B. Subgrade Elevations: 6 inches below finish grade elevations indicated on drawings unless otherwise indicated.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.05 DELIVERY STORAGE AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the work are as indicated.

1.06 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

1.07 QUALITY CONTROL

A. Contractors responsible for placing fill material must be familiar with the geotechnical report included in Section 00 3100 of these specifications.

B. The geotechnical engineer must approve quality and source of all fill material.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol GC, SC, CL, GP, GM AND SM.
   4. May be soil removed from excavations.
   5. Alternate material if approved by architect.

B. Structural Fill: Imported borrow.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol GC, SC, CL.
      a. Liquid limit no greater than 45; ASTM D 4318.
      b. Plasticity index less than 25; ASTM D 4318.
   4. Alternate material if approved by the geotechnical engineer and the architect.
   5. Do not use soils excavated on site for structural fill.
   6. Conforming to ASTM D2487 Group Symbol CL.
      a. Dry density of 115.0 pcf.
      b. Plasticity index between 5 and 20; ASTM D4318.

C. Concrete for Fill: As specified in Section 03 3000; compressive strength of 2500 psi.

D. Granular Fill - Fill Type AHTD Class 7: Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with AASHTO T 11 and T 27, within the following limits:
      a. 1-1/2 inch sieve: 100 percent passing.
      b. 3/4 inch sieve: 50 to 90 percent passing
      c. No. 4 sieve: 25 to 55 percent passing
      d. No. 40: 10 to 30 percent passing
      e. No. 200: 3 to 10 percent passing.

E. Granular Fill - Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Grade in accordance with ASTM D 2487 Group Symbol SW.
   2. Washed masonry sand with no more than 10% fines may be used.

F. Topsoil: See Section 31 2200.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support imposed loads by the fill.

D. Verify that survey bench marks and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Strip topsoil and stock pile as directed.

B. Proof roll with loaded tandem axle truck or equivalent to identify soft spots.
   1. Any soft spots identified will be undercut as directed by the architect/geotechnical engineer. Costs for any undercut will be by change order and is not included in base bid.
   2. At the direction of the architect/geotechnical engineer, cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill if within limits of building or paving; general fill for other site areas. Costs for cutting out soft areas will be by change order and is not included in the base bid.
   3. No undercut is to be completed without prior approval of architect.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen material.

B. Fill to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain moisture content of fill materials to attain required compaction density as specified in the geotechnical report.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2.4 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete or flowable fill.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density within a water content above optimum; ASTM D-1557 modified proctor..

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving and slabs-on-grade: 95 percent of maximum dry density within a water content range above optimum; ASTM D-1557 modified proctor.
   2. At other locations: 92 percent of maximum dry density within a water content range above optimum; ASTM D 1557 modified proctor.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.05 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill at all areas to be covered by paving and area to be covered by building:
   1. Fill to subgrade elevations.

2. Maximum depth per lift: 6 inches, compacted.
3. Compact to minimum 95 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor.

C. Under Interior Slabs-On-Grade:
1. Use granular fill.
2. Depth: 4 inches deep.

D. At Foundation Walls:
1. Use general fill.
2. Fill to subgrade elevation.
3. Compact each lift to 95 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor..
4. Do not backfill against unsupported foundation walls.
5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Buried Utility Piping and Conduits in Trenches:
1. Bedding: Use granular fill or sand.
2. Cover with general fill.
3. Fill to subgrade elevation.
4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

F. At Lawn Areas:
1. Use general fill.
2. Fill to 6 inches below finish grade elevations.
3. Compact to 90 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor..
4. See Section 31 2200 for topsoil placement.

G. At over-excavated footings:
1. Use concrete fill or flowable fill.

3.06 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

C. Top Surface of Filling under Floor Slabs: +/- 1/8 inch from required elevation.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. 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 shall notify architect when fill work is in progress.
6. Test locations will be selected at random by architect with an effort made to select areas of questionable compaction.

F. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.08 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 3119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative metal fence and gate systems.

1.02 RELATED REQUIREMENTS

A. Section 03 3300 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

1.03 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process; 2009a.

B. ASTM B 117 - Practice for Operating Salt-Spray (Fog) Apparatus; 2009.

C. ASTM B221 – Aluminum and Aluminum Alloy Extruded Bars, Shapes and Tubes.

D. ASTM D 523 - Test Method for Specular Gloss; 2008.

E. ASTM D 714 - Test Method for Evaluating Degree of Blistering in Paint; 2002 (Reapproved 2009).

F. ASTM D 822 – Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

G. ASTM D 1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments; 2008.

H. ASTM D 2244 - Test Method for Calculations of Color Differences from Instrumentally Measured Color Coordinates; 2009b.

I. ASTM D 2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2004).

J. ASTM D 3359 - Test Method for Measuring Adhesion by Tape Test; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Submit 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. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

D. Installer's Qualification Statement.

E. Manufacturer's Warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified.

1.07 DELIVERY, STORAGE AND HANDLING

A. Upon receipt at job site, all materials shall be checked to ensure that no damage occurred during shipping or handling.

B. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.08 WARRANTY

A. All structural fence components (i.e. rails, pickets and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from the date of original purchase. Warranty shall cover any defects in material finish.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of the warranty shall be guaranteed for five (5) years from the date of original purchase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fence and Gate Systems:
   1. Ameristar Fence Products, Inc: www.ameristarfence.com.
      a. **Design intent is to match existing fence/gate system.**
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
   1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F 2408.

B. Electro-Deposition Coating: Multi-stage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils, minimum.
   2. Color: As selected by Architect from manufacturer's standard range.
   3. Coating Performance: Comply with general requirements of ASTM F 2408.
      a. Adhesion: ASTM D 3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Corrosion Resistance: ASTM B 117, D 714 and D 1654; less than 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.
      c. Impact Resistance: ASTM D 2794; 60 inch pounds.
      d. Weathering Resistance: ASTM D 523, D 822 and D 2244; less than 60 percent loss of gloss.

C. Steel: ASTM A 653 / A 653M; yield strength 45,000 psi, minimum.
   1. Hot-dip galvanized; A 653/A 653M, G90.
   2. 62 percent recycled steel, minimum.

D. Equal to Ameristar Fence Products, Inc.

2.03 WELDED STEEL FENCE

A. Provide fence meeting requirements for Industrial class as defined by ASTM F 2408.

B. Fence Panels: Fusion welded; 6 feet high by length indicated on drawings.
   1. Panel Style: Three rail.
   2. Attach panels to posts with manufacturer's standard panel brackets.

C. Posts:
   1. Size: 2-1/2 inches square by 12 gage, with manufacturer's standard cap.

D. Rails: Manufacturer's standard, double-wall steel channel 1-3/4 inch square by 12 gage with pre-punched picket holes.
   1. Picket Retaining Rods: 0.125 inch galvanized steel.

E. Pickets: Steel tube.
   1. Spacing: 3-3/4 inch clear.
   2. Size: 1 inch square by 14 gage.
   3. Style: Pickets that culminate to an arrow-pointed spear.
   4. Finial: N/A.

2.04 GATES

A. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq x 12ga gate ends, and 1" sq x 14ga pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection.

B. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and a maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with a full range of adjustability, horizontal (.5"-1.375") and vertical (0-.5"). Maintenance free hinge-closer shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

C. Gates shall be height and length indicated on drawings.

2.05 MANUAL CANTILEVERED GATES

A. Gates: Complete factory-fabricated system of pickets, tracks, uprights, bracing, hardware and fasteners; finished with stratification coating.

B. Stratification Coating: Thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including as a minimum, a six-stage pretreatment/wash and a electrostatic spray application of a polyester finish.
   1. Topcoat: "no mar" TGIC polyester powder coat finish with minimum thickness of 2 mils.
   2. Color: To match existing.
   3. Coating Performance:
      a. Adhesion: ASTM D 3359 (Method B); 90% or more of coating remaining in tested area.
      b. Corrosion Resistance: ASTM B 117, D 714 and D 1654; less than 1/8" coating loss or medium #8 blisters after 1,000 hours.
      c. Impact Resistance: ASTM D 2794; 60 inch pounds.
      d. Weather Resistance: ASTM D 523, D 822 and D 2244; less than 60 percent loss of gloss.

C. Steel: Used for cantilever gate framing (uprights and diagonal bracing)
   1. ASTM A 653/A 653M; yield strength 34,800 PSI, minimum.
   2. Standard mill finish.

D. Steel: Used for fence posts and pickets
   1. ASTM A 653/A 653M; yield strength 45,000 PSI, minimum.
   2. Hot-dip galvanized; G90.

E. Aluminum Extrusions: Alloy
   1. Temper designation 6005-T5; ASTM B 221.

F. Equal to Ameristar Fence Products, Inc.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

3.03 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum distance from property line: 6 inches.

3.04 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence and gates with mild household detergent and clean water rinse well.

C. Touch up scratched surfaces using materials recommended by manufacturer. Match touchup paint color to fence and gate finish.

3.05 PROTECTION

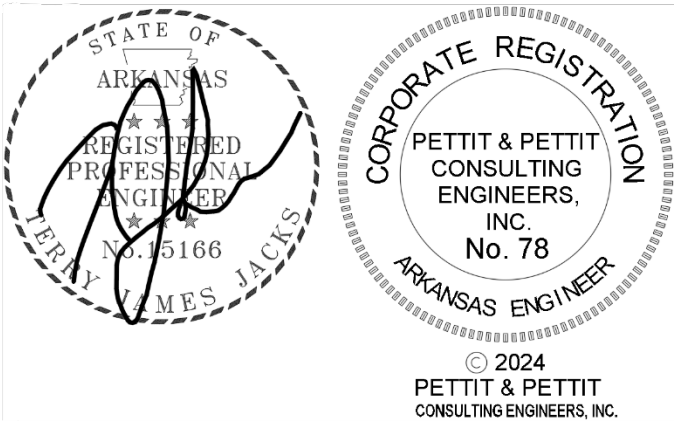
A. Protect installed products until completion of project.

B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

The Engineer of Record for Divisions 22 and 23 of the Specifications for Mechanical Renovations Project for Craighead County Courthouse HVAC Upgrades, Jonesboro, Arkansas, (P&P Job No. 23-077) is:

_____11/11/24_____
Date



SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for complete plumbing system.

1.02 RELATED SECTIONS

A. Section 22 0548 – Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 22 1005 – Plumbing Piping.

C. Section 31 2316 – Excavation.

1.03 SITE INSPECTION

A. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.

B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.04 DRAWINGS

A. Mechanical drawings show general arrangement of piping ductwork, equipment, etc. Follow closely as actual building construction and work of other trades will permit.

B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.

C. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories required to meet the conditions.

D. Record difference between mechanical work as installed and as shown in Contract Documents on a set of prints of mechanical drawings to be furnished by Architect. Return these prints to Architect at completion of project. These will be labeled "Contractor Revised Drawings".

1.05 SUBSTITUTIONS

A. The naming of specified items on the drawings or in the specifications is intended to establish a level of quality and performance. Substitution requests may be submitted at the time of shop drawing submittal. Review of substituted equipment or material prior to the Bid Date will not be considered unless otherwise specified.

B. Substitution shall be submitted as specified in Division 01.

1.06 CODE REQUIREMENTS, FEES & PERMITS

A. Perform work in accordance with applicable provisions of state and local Plumbing Code, gas ordinances and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations and ordinances.

B. In case of differences between building codes, state laws, local ordinances, utility company regulations and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.

1.07 CONTRACTOR REVISED DRAWINGS

A. The contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.

B. Exact location of all underground utility service entrances and their connections to utility mains, well heads, loop piping and all valves, etc., which will be concealed in the finished work shall be accurately indicated on the drawings by measured distances.

C. Upon completion of the work and prior to final payment, the contractor shall furnish to the Architect, one set of "contractor revised" prints, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

D. Contractor shall include all addendum items and field change order information on the revised drawings. Revise all schedules shown on the drawings to reflect the actual model numbers, capacities and electrical characteristics of substituted equipment.

1.08 COORDINATION OF WORK

A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to Architect. Should conditions arise where certain changes would be advisable, secure Architect's approval of these changes before proceeding with work.

B. Coordinate work of various trades in installing inter-related work. Before installation of mechanical items, make proper provisions to avoid interferences in a manner approved by Architect. Changes required in work specified in Division 22 caused by neglect to do so shall be made at no cost to Owner.

C. Provide inserts and supports required by Division 22 unless otherwise noted. Furnish sleeves, inserts, supports and equipment that are an integral part of other divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location of installation of items above shall be borne by Division 22.

D. Be responsible for required digging, cutting and patching incident to work of this Division and make required repairs afterward to satisfaction of Architect. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns or trusses.
   1. Each Section of this Division shall bear expense of cutting, patching, repairing and replacing of work of other Sections required because of its fault, error, tardiness or because of damage done by it.
   2. Cutting, patching, repairing and replacing pavements, sidewalks, roads and curbs to permit installation of work of this Division is responsibility of Section installing work.

E. Adjust locations of pipes, etc. to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
   1. Make offsets, transitions, and changes in direction of pipes, as required to maintain proper headroom and pitch of sloping lines whether or not indicated on Drawings.

F. Slots and openings through floors, walls, ceilings and roofs shall be provided by other Divisions in their respective materials. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.09 EXCAVATION AND TRENCHING FOR PIPING

A. Excavate to the depths indicated on the Drawings or as otherwise specified. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulated therein shall be removed by pumping or by other approved method. Do sheeting and

shoring as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of trench may be tunneled if the pipe can be safety and properly installed and backfill can be properly tamped in such tunnel sections.

B. Trench Excavation: Bottom of trench for tile or concrete pipe shall be rounded so that at least the bottom quadrant of the pipe rests firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered, excavate to a minimum overdepth of 4" below trench depths indicated on the drawings or specified. Overdepths in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered, such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.

C. Depth of Cover: Trenches shall be of depth that will provide a minimum depth of cover of three feet for water, sanitary and storm sewer and two feet for gas piping from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

1.10 BACKFILLING OF TRENCHES

A. Trenches shall not be backfilled until required pressure and other tests have been performed, inspection of utility and Code officials have been accomplished, and until the utilities systems as installed conform to requirements of drawings and specifications.

B. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones over 2-1/2 inch maximum dimension, deposited in 6 inch layers and compacted to 95% of the maximum laboratory density determined in accordance with ASTM D-698, Moisture-Density Relation of Soils. Tests for maximum density will be made with expense borne by contractor. If fills fail to meet the specified densities, the contractor shall remove and recompact the fill until specified densities are achieved.

C. Tests for Displacement of Sewers: After the trench has been backfilled to 2 feet or more above the pipe, if the pipe shows poor alignment, displaced pipe, or any other defects, such defects shall be remedied by the contractor at his expense.

1.11 GENERAL PIPING INSTALLATION

A. Furnish and install a complete system of piping. The piping drawings are diagrammatic and indicate the general location and connections. If the size of any piping is not clearly evident, obtain instructions from the Architect before proceeding with the work. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the contractor from responsibility for the proper erection of systems of piping in every respect suitable for the work intended. Piping systems that are not to be installed complete shall be so noted.

B. Erection: Piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing. Remove all burrs and cutting slag by reaming or other cleaning methods. Changes in direction shall be made with fittings, except that bendings of pipe will be permitted, providing a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformation will not be acceptable. Piping shall be arranged so as not to interfere with removal of other equipment or devices nor to block access manholes or other access openings. Piping shall be installed to insure noiseless circulation.

C. Minimum slope of piping shall be in accordance with the following unless otherwise specifically shown on the drawings or specified:

Type of Piping Fluid Conveyed	System Component	Length for 1" Fall	Direction of Fall
Sewer, Sanitary	Main or Branch	4 feet	Direction of flow

Domestic Water	Main or branch	40 feet	Back to mains

Sanitary and storm drainage piping 4 inches in diameter and larger may be pitched with one (1) inch fall for eight (8) foot lengths.

D. Protection: Open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the system. Plugs or rags, wood, cotton, concrete, waste or similar materials must not be used in plugging.

E. Installation of Underground Pipe: Bottom of trench shall be shaped to give substantially uniform circumferential support to lower third of each pipe. Pipe shall be laid true to line and grade in such manner as to form a close concentric joint with adjoining pipe and to prevent sudden offsets to flow line. As work progresses, interior of pipe shall be cleared of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe size, a suitable swag or drain shall be kept in pipe and pulled forward past each joint immediately after jointing has been completed. Trenches shall be kept free from water until pipe jointing has set and pipe shall not be laid when condition of trench or weather is unsuitable for such work.

F. Cleaning and Flushing: Contractor shall take every precaution to remove dirt, grease, and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be flushed with clean water except where specified otherwise.

G. Pipe Sizes: If the size of any piping is not clearly evident in the drawings, the contractor shall request instructions from the Architect as to the proper sizing. Any changes resulting from the contractor's failure to request clarification shall be at his expense.

1.12 THERMAL AND MOISTURE PROTECTION

A. Install flashing, counterflashing and caulk or seal all penetrations in exterior walls or floors as required to prevent exterior moisture from entering building.

1.13 EQUIPMENT AND MATERIALS

A. Product Approvals:
   1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
   2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in specification.

B. Use domestic made pipe, pipe-fittings and motors on project.

C. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connection and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.

D. Follow Manufacturer's directions in delivery, storage, protection and installation of equipment and materials.
   1. Promptly notify Architect in writing of conflicts between requirements of Contract Documents and manufacturer's directions and obtain Architect's written instructions before proceeding with work. Bear expenses arising from correcting deficiencies of work that do not comply with Manufacturer's directions or such written instructions from Architect.

E. Deliver equipment and material to site and tightly cover to protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.14 REVIEW OF MATERIALS AND EQUIPMENT

A. Furnish complete catalog data for manufactured items of equipment to be used in Work to architect for review within 30 days after award of Contract.

B. Submit six (6) copies of data in 3-ring binders with tab indices in same order and name as they appear in specification.
   1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions and other pertinent information. Pertinent information shall include as a minimum those items as scheduled on the drawings. Arrange submittal information to reflect these categories scheduled on the drawings.
   2. Provide an index of tab numbers at the front of each binder. List the specification number and category included under each tab as described in the specifications and as scheduled on the drawings.
   3. Provide cover sheet for each tab section. List each piece of equipment by name, model number and supplier.
   4. Underline applicable data and indicate model being supplied on each submittal sheet.

C. If data is not submitted as specified or submittal is not complete, it will be returned without review.

D. Catalog data or shop drawings for equipment which are noted as being reviewed by the Architect, shall not supersede Contract Documents.

E. Review comments of Architect shall not relieve this Division from responsibility for deviations from Contract Documents unless Architects' attention has been called to such deviations in writing at the time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

F. Check work described in catalog data with Contract Documents for deviations and errors.

1.15 GUARANTEE

A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or in the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.

B. The Contractor shall, after completion of the original test of the installation, and acceptance of the Architect, provide any service incidental to the proper performance of the mechanical systems under guarantees outlined above for a period of one (1) year.

1.16 FINALLY

A. It is the intention that this specification shall provide a complete installation except as hereinbefore specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included.

B. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 22 0513

COMMON ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section specifies the basic requirements for electrical components which are an integral part of packaged PLUMBING equipment. These components include, but are not limited to factory-installed motors furnished as an integral part of plumbing equipment.

B. This section specifies the basic requirements for electrical components required to be furnished under Division 22, which are to be turned over to and installed by Division 26. These components include but are not limited to motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for plumbing equipment are scheduled on the drawings.

1.02 RELATED SECTIONS

A. Division 22 – All Sections.

1.03 REFERENCES

A. NEMA Standards MG-1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70).

F. Compliance and Labeling: Provide motors and starters which have been listed and labeled by a nationally recognized testing facility engaged in and equipped to test electrical equipment and materials.

1.04 SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

A. Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.01 MOTORS

A. The following are basic requirements for simple or common motors, for special motors, more detailed and specific requirements are specified in the individual equipment specifications.
   1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
   2. Motor sizes shall be large enough so that driven load will not requirement the motor to operate in the service factor range.
   3. 2-speed motors shall be 2 separate windings on polyphase motors.
   4. Temperature Rating: Rated for 40 deg. environment, with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).
   5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly timed spaced starts per hour for manually controlled motors.

6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
   1. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
   2. Bearings:
      a. Ball or roller bearings with inner and outer shaft seals;
      b. Regreasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
      c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
      d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
   3. Enclosure Type:
      a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;
      b. Guarded drip-proof motors where exposed to contact by employees or building occupants;
      c. Weather protected Type I for outdoor use, Type II where not housed;
   4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
   5. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.
   6. Efficiency: Provide "Energy Efficient" motors with a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a minimum efficiency as listed below.

1HP	80% Eff'y	10HP	87%
1-1/2 to 2HP	82%	15HP	89%
3HP	83%	20HP	90%
5HP	84%	25HP and up	91%
7-1/2 HP	85%		

C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

Baldor Electric Co.
Century Electric, Inc.
General Electric Co.
Marathon Electric Mfg. Co.
Reliance Electric Co.
Westinghouse Electric Corp.

D. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

SECTION 22 0516

EXPANSION COMPENSATION FOR PLUMBING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for expansion compensation for the plumbing system.

1.02 RELATED SECTIONS

A. Section 22 0548 – Vibration and Seismic controls for Plumbing Piping and Equipment.

B. Section 22 1005 – Plumbing Piping.

C. Section 31 2316 – Excavation.

1.03 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of expansion compensation product. Submit schedule showing Manufacturer's figure number, size, location, and features for each required expansion compensation product.

B. Shop Drawings: Submit shop drawings for fabricated expansion loops indicating location, dimensions, pipe sizes, location and method of attachment of anchors.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of expansion compensation product. Include this data in Maintenance Manual.

1.04 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of expansion compensation products of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Comply with standards of the Expansion Joint Manufacturer's Association (EJMA).

PART 2 - PRODUCTS

2.01 PIPE ALIGNMENT GUIDES

A. General: Provide pipe alignment guides on both sides of expansion joints, and elsewhere as indicated. Construct with 4 finger spider traveling inside a guiding sleeve, with provision for anchoring to building substrate.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pipe alignment guides which may be incorporated in the work include, but are not limited to, the following:

Keflex, Inc.
Metraflex (The) Co.

PART 3 - EXECUTION

3.01 EXPANSION LOOPS

A. General: Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.

END OF SECTION

SECTION 22 0519

METERS AND GAUGES FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extent of meters and gauges required by this section is indicated on drawings and/or specified in other Division-22 sections.

B. Types of meters and gauges specified in this section include the following:
   1. Temperature Gauges and Fittings:
      Glass Thermometers.
      Dial Type Insertion Thermometers.
      Thermometer Wells.
      Temperature Gauge Connector Plugs.
   2. Pressure Gauges and Fittings:
      Pressure Gauges.
      Pressure Gauge Cocks.
      Pressure Gauge Connector Plugs.

C. Meters and gauges furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division-22 sections.

1.02 RELATED SECTIONS

A. Section 22 1005 – Plumbing Piping.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of meters, gauges, and fittings, or types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. UL Compliance: Comply with applicable UL standards pertaining to meters and gauges.

C. ANSI and ISA Compliances: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of meter, gauge and fitting. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter, gauge and fitting schedule shown manufacturer's figure number, scale range, location, and accessories for each meter, gauge and fitting.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter and gauge. Include this data in maintenance manual.

PART 2 PRODUCTS

2.01 TEMPERATURE GAGES

A. Glass Thermometers:
   1. General: Provide glass thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
   2. Case: Die cast aluminum, finished in baked epoxy enamel, clear acrylic plastic front, spring secure, 9 inches long.
   3. Adjustable Joint: Die cast aluminum, finished to match case, 180 degree adjustment in

vertical plane, 360 degree adjustment in horizontal plane, with locking device.

4. Tube and Capillary: Mercury filled, magnifying lens, 1 percent scale range accuracy, shock mounted.
5. Scale: Satin faced, non-reflective aluminum permanently etched markings.
6. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.
7. Range: Conform to the following:
   a. Hot Water: 30 degrees - 240 degrees F with 2 degree F scale divisions (0 degrees - 160 degrees Celsius) with 1 degree Celsius scale divisions.
   b. Chilled Water: 30 degrees - 180 degrees F with 2 degrees F scale divisions (0 degrees-100 degrees Celsius) with 1 degree Celsius scale divisions.
8. Available Manufacturers: Subject to compliance with requirements, manufacturers offering glass thermometers which may be incorporated in the work include, but are not limited to, the following:
   Marshalltown Instruments, an Eltra Co.
   Trerice (H.O.) Co.
   Weiss (Albert A) & Son, Inc.

B. Dial Type Insertion Thermometers:
1. General: Provide diam type insertion thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
2. Type: Bi-metal, stainless steel case and stem, 1 inch diameter dial, dust and leak proof, 1/8 inch diameter stem with nominal length of 5 inches.
3. Accuracy: 0.5 percent of dial range.
4. Range: Conform to the following:
   a. Hot Water: 0 degrees - 220 degrees F (-10 degrees - 110 degrees C).
5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering direct mount dial type insertion thermometers which may be incorporated in the work include, but are not limited to, the following:
   Marsh Instrument Co, Unit of General Signal.
   Taylor Instrument Process Control Div. of Sybron Corp.
   Trerice (H.O.) Co.
   Weiss (Albert A.) & Son, Inc.

C. Thermometer Separable Wells:
1. General: Provide thermometer wells constructed of brass or stainless-steel, pressure rated to match piping system design pressure. Provide 2inch extension for insulated piping.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering thermometer wells which may be incorporated in the work include, but are not limited to the following:
   Marsh Instrument Co., Unit of General Signal.
   Trerice (H.O.) Co.
   Weiss (Albert A.) & Sons, Inc.

D. Temperature Gage Connector Plugs:
1. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200 degrees F. Construct of brass and finish in nickel-plate, equip with 1/2 inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8 inch O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering temperature gage connector plugs which may be incorporated in the work include, but are not limited to, the following:
   Peterson Engineering Co.

2.02 PRESSURE GAGES AND FITTINGS

A. Pressure Gages:
   1. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
   2. Type: General use, 1 percent accuracy, ANSI B40.1, Grade A, phosphor bronze bourbon type, bottom connection.
   3. Case: Drawn steel or brass, clear acrylic plastic lends, 4-1/2 inch diameter.
   4. Connector: Brass with 1/4 inch male NPT. Provide protective syphon when used for steam service.
   5. Scale: White coated aluminum with permanent etched markings.
   6. Range: Conform to the following:
      a. Water: 0 - 100 psi.
   7. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauges which may be incorporated in the work include, but are not limited to, the following:

      Ametek, U.S. Gauge Div.
      Marsh Instrument Co., Unit of General Signal.
      Marshalltown, an Eltra Company
      Trerice (H.O.) Co.
      Weiss (Albert A.) & Son, Inc.

B. Pressure Gage Cocks:
   1. General: Provide pressure gauge cocks between pressure gages and gauge tees on piping systems. Construct gage cock of brass with 1/4 inch female NPT on each end, and "T" handle brass plug.
   2. Syphon: 1/4 inch straight coil constructed of brass tubing with 1/2 inch male NPT on each end.
   3. Snubber: 1/4 inch brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
   4. Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gage cocks which may be incorporated in the work include, but are not limited to, the following:

      Ametek, U.S. Gauge Div.
      Marsh Instrument Co., Unit of General Signal.
      Marshalltown, An Eltra Company
      Trerice (H.O.) Co.
      Weiss (Albert A.) & Son, Inc

C. Pressure Gage Connector Plugs:
   1. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200 degrees Fahrenheit. Construct of brass and finish in nickel-plate, equip with 1/2 inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8 inch O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.
   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauge connector plugs which may be incorporated in the work include, but are not limited to, the following:
      Peterson Engineering Co.

PART 3 - EXECUTION

3.01 INSTALLATION OF TEMPERATURE GAGES

A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by

observer standing on floor.

B. Thermometer Separable Wells: Install in piping for each temperature gage.

C. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.02 INSTALLATION OF PRESSURE GAGES

A. General: Install pressure gages in piping with pressure gage cock, located on pipe at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated:
   1. At suction and discharge of each hydronic pump or as a common gauge, if so detailed on drawings.
   2. At each pressure reducing valve on both the high pressure and low-pressure sides.
   3. At water service outlet.

C. Pressure Gage Cocks: Install in piping tee with snubber.

D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

END OF SECTION

SECTION 22 0548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

A. The requirements for seismic protection measures to be applied to plumbing equipment specified herein are in addition to any other items called for in other sections of these specifications. The seismic protection shall conform to Category D of the 2007 Arkansas Fire Prevention Code. The Plumbing equipment shall include the following items to the extent required on plans or in other sections of the following specifications:

Piping, 2-1/2 inches or larger
Components weighting more than 75 pounds
Water Heaters

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Basic Requirements - Section.

1.03 APPLICABLE PUBLICATIONS

A. American Society of Civil Engineers: ASCE 7

B. Federal Specifications:
1. RR-W-410D

1.04 REGULATORY REQUIREMENTS

A. Conform to 2007 Fire Prevention Code.

PART 2 PRODUCTS

2.01 Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

2.02 Sway brace of structural steel conforming with ASTM A36.

2.03 Mechanical couplings of the sleeve type to provide a tight flexible joint under all reasonable conditions.

2.04 Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B12.2.2 and ASTM A307or 306.

2.05 Guy wires where required shall conform to Fed Spec. RR-W-441 as follows:

5/32" diameter	Type V, Class 1
3/16" to 5/16" diameter	Type V, Class 2
1/4" to 5/8" diameter	Type I, Class 2

PART 3 EXECUTION

3.01 All rigidly mounted equipment will have a minimum of four (4) anchor bolts securely fastened through bases or backs. Anchor bolts must conform to ASTM A307. Anchor bolts shall have an embedded straight length equal to at least twelve times the nominal diameter of the bolt and shall conform to the applicable tables for various equipment weights.

Maximum Equipment Weight (Pounds)	
500	1/2
1,000	1/2
5,000	1/2
10,000	1/2

20,000	1/2
30,000	5/8
50,000	3/4
100,000	1

Based on four (4) bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional area when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure, except that an equipment weight equal to five times the actual equipment weight shall be used

3.02 Equipment Sway Bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with no less than 1/2 inch bolts. Braces shall conform to all applicable codes and standards for Seismic Classification. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45-degrees, provided that supporting members are properly sized to supporting operating weight of equipment when inclined at a 45-degree angle.

3.03 Sway bracing shall be provided for all 2-1/2 inch or larger pipes, not individually supported with hangers 12 inches or less in length.

3.04 All components that weight more than 75 pounds shall have a safety chain or safety cable in

3.05 Water heaters and pumps shall be bolted to the housekeeping pads in accordance with Paragrqaph 3.01.

3.06 Powder-activated fasteners (shot pins) shall not be used for anchorage.

3.07 Vibration isolators shall have a bumper restraint in each horizontal direction, and vertical restraints shall be provided where required to resist overturning.

3.08 Oversized plate washers extending to the equipment wall shall be used at bolted connections through the base sheet metal if the base is not reinforced with stiffeners or not capable of transferring the required loads.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-23 sections.

B. Type of identification devices specified in this section include the following:

Plastic Pipe Markers.
Valve Tags.
Valve Schedule Frames.
Engraved Plastic-Laminate Signs.
Ceiling Tacks.

C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of the equipment assembly in other Division-23 sections.

1.02 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

1.03 SUBMITTALS

A. Product Data: Submit product specifications and installation instructions for each identification material and device desired.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.

PART 2 PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-21 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

B. Plastic Pipe Markers:
   1. General: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
      a. Small Pipes: For external diameters less than 6 inches (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
         (1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.

(2) Adhesive lap joint in pipe marker overlap.
(3) Laminated or bonded application of pipe marker to pipe (or insulation).

b. Large Pipes: For external diameters of 6 inches and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
(1) Laminated or bonded application of pipe marker to pipe (or insulation)
(2) Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.

c. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.

d. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

e. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Valve Tags:
1. At the Contractor's option, provide one of the following:
a. Brass Valve Tags: provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch diameter tags, except as otherwise indicated.
b. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32 inch thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch square black tags with white lettering, except as otherwise indicated.
2. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

D. Valve Schedule Frames:
1. General: For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on walls. Provide frames of rigid plastic or metal, with plastic glazing.

E. Engraved Plastic-Laminate Signs:
1. General: Provide engraving stock melamine plastic laminate, complying with FS L- P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16 inch for units up to 20 square inches or 8 inch length; 1/8 inch for larger units.
3. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plastic pipe markers which may be incorporated in the work include, but are not limited to, the following:

Seton Name Plate Company
EMED Co., Inc.
Approved equal.

2.02 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide

numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/ maintenance of plumbing systems and equipment.

B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service.

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:
   1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Piping System Identification:
   1. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, (shafts, tunnels, plenums), exterior non-concealed locations and above removable acoustical ceilings.
      a. Near each valve and control device.
      b. Near each branch, excluding short take-offs for fixtures, mark each pipe at branch, where there could be question of flow pattern.
      c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
      d. At access doors, manholes and similar access points which permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced intermittently at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
      g. On piping above removable acoustical ceilings.

C. Valve Identification:
   1. General: Provide valve tag on every valve, cock and control device in each piping system.
   2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
      a. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

D. Plumbing Equipment Identification:
   1. General: Install engraved plastic laminate sin on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
      a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
      b. Pumps and similar motor-driven units.
      c. Fans, blowers, primary balancing dampers and mixing boxes.
      d. Central-station units.
      e. Tanks and pressure vessels.
      f. Motor starters and other control equipment.

E. Refer to Division-22 sections for identification requirements at central-station mechanical control center; not work of this section.

F. Refer to Division-26 sections for identification requirements of electrical work; not work of this section.

G. Lettering Size: Minimum 3/8 inch high lettering for name of unity where viewing distance is less than 2'-0"; 3/4 inch high for distances up to 6'-0"; and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 the size of principal lettering.

H. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, and warn of hazards and improper operations.

I. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Insulation Requirements for complete plumbing piping system.

1.02 RELATED SECTIONS

A. Section 22 0500 – Common Work Results for Plumbing.

B. Section 22 0548 – Vibration and Seismic Controls for Plumbing Piping and Equipment.

C. Section 22 0553 – Identification for Plumbing Piping

D. Section 22 1005 – Plumbing Piping.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

H. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

I. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

J. ASTM E96 - Water Vapor Transmission of Materials.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 and Section 22 0500.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/100 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 22 0500.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 PRODUCTS

2.01 GLASS FIBER

A. Insulation: ASTM C547; rigid molded, noncombustible.
   1. "K" value: ASTM C335, 0.24 at 75 degrees F.
   2. Minimum Service Temperature: -20 degrees F.
   3. Maximum Service Temperature: 850 degrees F.
   4. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket:
   1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
   3. Secure with adhesive applied to longitudinal laps and butt strips.
   4. Secure with vapor barrier mastic.
   5. Self-sealing laps may be used provided lap seal is additionally sealed with vapor barrier masters.
   6. Maximum Water Vapor Transmission: 0.1 perm.

2.02 APPROVED MANUFACTURERS

A. Glass Fiber:
   1. Owens/Corning Fiberglass.
   2. Architect Approved - Other acceptable manufacturers offering equivalent products.

B. Vapor Barrier Jacket Lap Adhesive - Compatible with insulation:
   1. Foster 25.
   2. Architect Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory applied or field applied.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
   3. Finish with glass cloth and vapor barrier adhesive.
   4. PVC fitting covers may be used.
   5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. For insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
   3. Finish with glass cloth and adhesive.
   4. PVC fitting covers may be used.
   5. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
   6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Inserts and Shields:
   1. Application: Piping 1-1/2 inches 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 long, of same thickness and contour as adjoining insulation; may be factory fabricated.

F. Finish insulation at supports, protrusions, and interruptions.

G. For 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 or stainless-steel jacket with seams located on bottom side of horizontal piping.

H. For buried piping, provide factory fabricated assembly with inner all-purpose service jacket with self sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

I. For 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.

J. Valves and fittings insulated with block insulation shall be finished with insulating cement and troweled to a smooth and uniform finish.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

PIPING SYSTEMS	THICKNESS
A. Plumbing Systems	
Domestic Hot Water Supply	1 inch
Domestic Hot Water Recirculation	1 inch
Domestic Cold Water (Indoors)	1/2 inch
Domestic Cold Water (Out of Doors)	1 inch

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for complete plumbing piping system.

1.02 RELATED SECTIONS

A. Section 22 0500 – Common Work Results for Plumbing.

B. Section 22 0553 – Identification for Plumbing Piping

C. Section 22 0548 – Vibration and Seismic controls for Plumbing Piping and Equipment.

D. Section 31 2316 – Excavation.

1.03 QUALITY ASSURANCE

A. Manufacturers shall be firms regularly engaged in manufacturer of plumbing piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer shall be a firm with at least 3 years of successful installation experience on projects with plumbing piping system work similar to that required for project.

C. Comply with applicable provisions of ANSI B31.2 “Fuel Gas Piping”, applicable provisions of NFPA 54 (ANSI Z223.1) “National Fuel Gas Code”, ANSI Z223.1a “Supplement to National Fuel Gas Code” and with requirements of the local gas company.

D. Comply with applicable codes and standards.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 and Section 22 0500.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer’s Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with a minimum three years experience.

PART 2 PRODUCTS

2.01 DOMESTIC HOT AND COLD-WATER SYSTEMS

A. Pipe
1. Type “K” hard drawn copper, as made by Mueller Brass Co., for piping underground or beneath concrete slab.
2. Type “L” hard drawn copper, as manufactured by Mueller Brass Co., for above ground applications.

B. Fittings
1. Wrought copper.

C. Connections
1. Sweat copper type with Stay-Safe “Bridgit” lead free silver bearing solder with Stay-Clean liquid or Stay-Clean paste flux as manufactured by J. W. Harris Co., Inc. Joints under slabs shall be brazed with Sil-fos brazing alloy.

D. Valves
1. Use gate valves exclusively unless otherwise specified. All valves shall be by a single manufacturer from the approved list (reference Section 15100). Valves shall be for 150psi SWP.
2. All valves shall be brass, of screwed pattern, gland stuffing box, solid wedge double seal for gate valves, non-rising stem.

E. Unions
1. All union connections on piping 2” and smaller shall be ground joint brass union, having brass taper seat and both screw ends hexagonal and shall be designed for a steam working pressure up to 150 pounds.

F. Origin
1. Unless specifically specified otherwise, all material and products shall be manufactured in the United States of America.

2.02 SANITARY SEWER, SOIL, STORM, WASTE AND VENT PIPING SYSTEMS

A. Piping Above Floor – PVC Drainage Pipe:

1. All piping shall be PVC (polyvinyl chloride), Schedule 40, DWV, ASTM D-2655-77 with NFS seal of approval. PVC-DWV pipe shall be marked as prescribed in ASTM D-2665 to indicate the manufacturer’s name or trademark, the ASTM designation Number D-2665, the nominal pipe size, the material abbreviation PVC and the product abbreviation DWV spaced along the entire pipe length at not more than 2-foot intervals. All pipe and fittings shall be the product of one manufacturer. Pipe shall be stored in lifts and loose pipe shall be stored on racks with a minimum support spacing of 3 feet. Pipe shall be shaded but not covered directly when stored outside in high temperatures. All pipe and fittings shall be approved by the Arkansas State Plumbing Code.
2. Generally, conventional pipe support hanger systems may be used but spacing must be 4 or 5 feet, branch fittings serving trap arms should also be secured to the framing to prevent movement. Hanger straps shall not be so tight as to compress, distort, cut or abrade the piping.
3. Vertical sections and their connecting branches and components shall be secured at each stack base and at sufficiently close intervals to keep the system in alignment and to adequately support the weight of the pipe and its contents.
4. Waste arms for lavatories and urinals shall be DWV copper with cast brass

adapters and wrought copper fittings and lead-free solder.

B. Piping Below Grade Except for Kitchen Drainage – PVC Drainage Pipe:

1. All piping below grade shall be PVC, Schedule 40, DWV, ASTM D-2655, shall adhere to the installation standards set forth in ASTM D2321 or its equivalent and the bedding and backfilling of PVC pipe shall be completed as described below.
2. For all PVC pipe, the trench excavation shall be extended to a minimum depth of 6 inches below the bottom of the pipe. Where additional excavation is required due to unacceptable soil conditions, the trench bottom shall be brought back up to grade using Class I or II bedding material. This bedding material shall be installed in no greater than 8-inch compacted lifts. All bedding material shall be compacted to a minimum density of 90 percent modified proctor as outlined in AASHTO-T180. The intent of this bedding is to provide uniform support for the flexible pipe. The remaining backfill shall be in accordance to the standard details and trench requirements. The Class I or II material shall extend for 6 inches below the pipe to 6 inches above the pipe. The maximum depth of bury for PVC pipe.

C. Piping Below Grade – Hub and Spigot Type (Kitchen Piping):
1. All piping below the floor and extended outside the building shall be standard weight cast iron soil pipe and fittings unless noted otherwise, as manufactured by Tyler Pipe, Charlotte Pipe, or Griffin Pipe. All cast iron soil pipe and fittings shall be of the reinforced hub type, coated inside and outside with coal tar varnish and shall conform to the ASTM “Standard Specifications for Cast Iron Soil Pipe and Fittings”.

D. Soil, waste, drain and vent piping must be of sizes noted and run as indicated on the drawings, and shall be given a uniform grade of ¼ inch per foot wherever possible, but in no case less than 1/8 inch per foot. The soil and waste pipes shall be extended through the roof. Each riser extending through the roof shall project 14” above roofline. Flashing shall be by roofing contractor. Counter flashing shall be by plumbing contractor. Where so shown, connect vents below roof.

E. Piping Exterior of Building:
1. Sanitary sewer pipe and fittings (exterior of the building) shall be same as waste piping it connects to.

F. Pipe Joints
1. PVC Solvent Welded Joints:
   a. All joints shall first be primed with purple primer/cleaner manufactured for PVC pipe. Do not use water, rags, gasoline, sandpaper or other substitutes for cleaning PVC surfaces.
   b. The cement shall be a bodied cement of approximately 800 to 1000 centipoise viscosity containing 10-20 percent (by weight) virgin PVC material solvated with tetrahydrofuran (THF). Select the proper cement (Schedule 40 cement for PVC shall be used with Schedule 40 PC pipe).
   c. Do not use all-purpose cements, ABS cement to joint PVC pipe and fittings. Apply cement with recommended applicators or pure bristle type paintbrush or the recommended size.
   d. All piping shall be cut squarely and deburred. Remove all excess cement from around the pipe and fittings with a dry cotton rag while cement is still soft. Do not attempt cementing in the rain or the presence of

moisture.

2. a) The cast iron hubless joint shall consist of cast iron soil pipe, fittings Clamp All Corporation, Anaheim Foundry Co. “Husky”, or approved equal, hubless soil pipe coupling made of 24-gauge Type 304 stainless steel with Hi-Torque Clamps tightened to 100+125 inch-pounds of torque. Coupling gaskets shall be made of neoprene and shall interlock with the housing assembly to make slip free joint. Pipe and fittings shall be inserted into the sleeve and firmly seated against the center rib or shoulder of the gasket. A sound joint shall be provided in field cut lengths of pipe by having square cut ends as smooth as possible. The stainless-steel bands shall be tightened alternately and firmly to not less than 100 inch-pounds of torque.

b) The reinforced hub cast iron soil pipes shall be joined with Tyler “Ty-Seal” neoprene joints.

c) Support piping at each joint and fitting and 10’-0” maximum spacing.

G. Cleanouts

1. Cleanouts shall be provided at the ends and points in change of direction of all drain, soil and waste pipes and branches thereof, at the foot of each riser, at all offsets, in all horizontal runs at approximately 50-foot intervals for piping 4” and smaller and 100' for larger piping, and at other points where indicated on the plans or where required.
2. All cleanouts in connection with cast iron pipe, except the traps and fittings on horizontal branches, shall have tapped “Y” fittings of same size as pipe up to 4 inches, and 4 inches for all larger pipe, closed with screw plugs. All other cleanouts in connection with cast iron pipe, except those that occur in finished floor and walls, shall have heavy cast iron ferrules same size as pipe up to 4 inches, and 4 inches for all larger pipe, caulked into hub and closed with a bronze screw plug.
3. All cleanouts in finished floors shall be Zurn ZN-1400-BP-LC “Level Trol”, Wade, or Jay R. Smith, with anchor flange and clamp collar, scoriated nickel-bronze access cover and adjustable frame; bronze cleanout plug shall be straight threaded with tapered shoulder.
4. All cleanouts in finished walls shall be Zurn ZN-1443-BP, Wade, or Jay R. Smith with polished nickel-bronze access cover and adjustable frame; bronze cleanout plug shall be straight threaded with tapered shoulder.
5. All cleanouts on exterior piping of building shall be Zurn “Level-Trol” ZN-1400-BP-HD, Wade, or Jay R. Smith, having heavy duty bronze top, as detailed on the Drawings.

H. Traps and Drains

1. P-traps shall be placed under all floor drains and where indicated in wastes, and at other points indicated on plans. P-traps shall be standard weight cast iron, deep seal type, bell and spigot pattern.
2. Drains shall be Zurn, Wade, or Jay R. Smith, in accordance with the schedule on the drawings.

I. Drain Pans

1. All floor drains, except for those in concrete slab above earthfill, shall be provided with non-plasticized chlorinated polyethylene, “Chloraloy 240”, brand concealed water proofing membrane as manufactured by the Noble Company of Grand Haven, Michigan, Compotite Corp. “Composeal”, or approved equal. Membrane shall be medium gray in color, textured surface finish both sides, have white or black lettering continuously marked “Chloraloy 240”, size 18 inches by 18 inches, turned up at least 1 inch, and meet applicable standards of ASTM. Complete

installation shall be in accordance with manufacturer's recommendations.

J. Origin
1. Unless specifically specified otherwise, all material and products shall be manufactured in the United States of America.

2.03 NATURAL GAS PIPING SYSTEM

A. Includes:
1. Necessary labor, materials, appliances and equipment required to provide gas service from existing campus master meter on east end of building and new meter on west end of building, building distribution system from (pound to ounce) pressure regulator valve at the building to gas fired equipment connections and accessories as shown on the drawings.

B. Quality Assurance
1. Manufacturers shall be firms regularly engaged in manufacturer of natural gas piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
2. Installer shall be a firm with at least 3 years of successful installation experience on projects with natural gas piping system work similar to that required for project.
3. Comply with applicable provisions of ANSI B31.2 "Fuel Gas Piping", applicable provisions of NFPA 54 (ANSI Z223.1) "National Fuel Gas Code", ANSI Z223.1a "Supplement to National Fuel Gas Code" and with requirements of Arkansas Louisiana Gas Company.

C. Natural Gas Piping Materials and Products
1. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials use in natural gas piping systems. Where more than one type of material or product is indicated, selection is Installer's option.

D. Basic Identification
1. Provide identification complying with Division-22 Basic Materials and Methods, Section 22 0553 "Identification for Plumbing Piping and Equipment".

E. Piping
1. Piping inside building shall be ASTM A-120-79, carbon steel, butt welded, Schedule 40 black steel.
2. Gas service outside building in ground shall be plastic pipe. Plastic pipe shall be "SDR-11 Driscopipe 6500" with copper trace wire, or approved equal, conforming to ASTM C2513. Connections and transition fittings shall be made by heat fusion, mechanical coupling. Mechanical coupling shall have internal stiffeners. Insulated fittings shall be provided at the meter and in the vertical rise above grade at the building. Transition fittings shall be provided at a minimum of 12 inches from all vertical risers to above grade. Gas piping shall be laid at least 24 inches below grade at all points.
3. Risers to building and to meter or pressure regulators shall be standard line pipe provided with a mill installed protective covering of Republic "X-Tru-Coat", high density polyethylene applied over an adhesive undercoating. All field joints and

fittings shall be protected with Republic "X-Tru-Tape" and primer, applied as per manufacturer's recommendations. Pipe coat/wrap shall extend a minimum of 6 inches above finish grade.

F. Fittings
1. Black Pipe:
a. Welded forged steel fittings meeting requirements of ASTM A 234-79a, or standard weight malleable iron screwed.
2. Fittings outside building shall have "X-Tru-Coat" covering.

G. Plug Valves (Cocks)
1. 1 inch and smaller:
a. Domestic Water shall be bronze, screw pattern, 125 psig, non-shock W.O.G. operating pressure, square head, lubricated tapered brass plug design, less check, FIP thread.
b. Natural gas and HVAC shall be iron, screw pattern, 125 psig, non-shock W.O.G. operating pressure, square head, lubricated tapered brass plug design, less check, FIP thread.
c. A.Y. McDonald Mfg. Co. #10686B, Dezurik/Sartell, or A/E approved equal.
2. 1-1/4 inches thru 2 inches:
a. Shall be semi-steel, screwed gland type, regular pattern, 200 CWP operating pressure, 400 psig test pressure, square head, lubricated tapered plug, FIP thread and conform to ANSI B2.1; ANSI B16.1; B116.10; API 5B; -A126, Class B and MSS SP-78.
b. Rockwell Nordstrom Valves, Inc. #114, Resun or Homestead.
3. 2-1/2 inches thru 4 inches:
a. Shall be iron, screw gland type, regular pattern, 200 CWP operating pressure, 400 psig test pressure, square head, lubricated tapered plug design, FIP thread or flanges drilled to ANSI class 125 cast iron flange standard template and conform to ANSI B2.1; ANSI B16.1; B116.10; API 5B; ASTM-A126, Class B and MSS SP-78.
b. Rockwell Nordstrom Valves, Inc. #115, Resun or Homestead.
4. 6 inches and larger:
a. Shall be iron, bolted gland type, short pattern, 200 CWP operating pressure, 400 psig test pressure, square head, lubricated tapered plug design, flanges drilled to ANSI class 125 cast iron flange standard template and conform to ANSI B2.1; ANSI B16.1; B116.10; API 5B; ASTM-A126, Class B and MSS SP-78.
b. Rockwell Nordstrom Valves, Inc. #143, Resun or Homestead.

H. Pressure Regulating Valves
1. Provide single stage, steel jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inches and smaller, flanged ends for 2-1/2 inches and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.
2. Regulators installed indoors shall be vented to outside full size or larger as required to eliminate excessive back pressure.
3. Regulators installed outdoors shall be installed such that vent face is downward, so as to avoid the entry of water and matter which would interfere with its operation.
4. Regulators shall be equal to Rockwell Mfg. Co. (Equimeter) with internal relief.

I. Meter and Setting
1. The existing gas meter one east end of building shall be reworked (if required) by the local gas company as required by new additional gas demand indicated on the

drawings. Install new meter of west end of building. All cost including any street and sidewalk repair shall be borne by this contractor.
NOTE: A new smaller gas meter and regulator and new gas service shall also be installed on southwest side of building shown on Drawing P101.

PART 3 EXECUTION

3.01 HOT AND COLD-WATER PIPING SYSTEMS

A. For general piping insulation, see Section 22 0719.

B. Install copper tubing under slabs without joints where possible.

C. Provide adaptors in copper lines for all valves.

D. Locate cold water lines a minimum of 12 inches from hot water line.

E. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two (2) hours and show no leaks.

F. Sterilize domestic water system with solution containing at least 250 parts per million of available chloride. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.

G. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.

H. Water system will not be accepted until a negative bacteriological test is made on water taken from system and dosing shall be repeated as necessary until such negative test is accomplished. Submit written report of test to Architect for his approval.

I. Install water hammer arresters as noted on the drawings.

J. Extend water service piping of size and in location indicated to water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry weathertight. Provide gate valve at water service entry inside building, strainer, pressure gauge, test tee and valve.

K. Provide hot and cold-water piping runouts to fixtures of sizes indicated, but in no case smaller than required by National Standard Plumbing Code.

L. Connect hot and cold-water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shut-off valve and union for each connection. Provide drain valve on drain connections.

3.02 SANITARY SEWER, SOIL, STORM, WASTE AND VENT PIPING SYSTEMS

A. Provide floor drains and other specialties as specified in the Schedule on the drawings and set forth in these specifications.

B. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gasses pass freely to atmosphere with no pressure of syphon condition on water seal.

C. Before piping is covered, conduct tests in presence of Architect and correct leaks or defective work. Do not caulk threaded work. Fill waste and vent system to roof level (a minimum of 10 feet) with water and show no leaks for two (2) hours.

D. Vent entire system to atmosphere. Discharge 14 inches above roof. Joint lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near an edge or valley.

E. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

F. Flash pipes passing through roof with six (6) lb/sq.ft. lead flashing fitted around pipes and turned down into pipe 1/2 inch with turned edge hammered against pipe wall.

3.03 INSTALLATION OF NATURAL GAS PIPING

A. Install natural gas distribution piping in accordance with applicable codes and local Utility Company requirements.

B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threaded burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped, or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

F. Install minimum 6-inch-long drip-legs in gas piping where indicated, and where required by code or regulation.

G. Install "Tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

H. Use dielectric unions where dissimilar metals are joined together.

I. Install piping with 1 inch drop in 60-foot pipe run (0.14%) in direction of flow.

J. Install piping parallel to other piping, but maintain minimum of 12-inch clearance between gas piping and steam or hot water piping above 200 degrees F.

K. Wrap and lay underground pipe with minimum of two (2) feet of cover in accordance with local gas utility company regulations and specifications.

L. Install gas cocks and unions at all final connections to equipment.

M. Do not use flexible pipe connections.

N. All field joints and fittings shall be protected with "X-Tru-Tape" and primer.

O. Bushings will not be accepted.

P. Test all gas piping with air pump and 3-inch dial gauge to pressure that will maintain 25

psig for 15 minutes.

Q. Provide sacrificial type cathodic protection for each vertical riser to the building.

R. Provide 5/8 inch by 8'-0" copper clad steel ground rod, ground rod clamp and No. 6 stranded copper conductor from ground rod to vertical riser at every instance where piping exits the earth.

3.04 GAS SERVICE

A. Consult with Gas Company as to extent of its work, meter requirements with consideration of Owner needs, costs, fees, and permits involved. Pay such costs and fees; obtain permits.

END OF SECTION

SECTION 22 1006

PLUMBING PIPING SPECIALTIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Valves and piping specialties, for complete Plumbing System.

1.02 RELATED SECTIONS

A. Section 22 0500 – Common Work Results for Plumbing.

B. Section 22 0553 – Identification for Plumbing Piping.

C. Section 22 0548 – Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Section 22 1005 – Plumbing Piping.

E. Section 31 2316 – Excavation.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for pipeline strainers. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required pipeline strainer.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of pipeline strainer. Include this data in Maintenance Manual.

PART 2 PRODUCTS

2.01 MANUFACTURED PIPING SPECIALTIES

A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Pipe Escutcheons:
   1. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
   2. Pipe Escutcheons for Moist and Wet Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
   3. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

C. Low Pressure Y-Type Pipeline Strainers:
   1. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends

matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64-inch perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping system.

2. Threaded ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
3. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering low pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:

   American Air Filter, an Allis-Chalmers Co.
   Armstrong Machine Works.
   Hoffman Specialty, ITT Fluid Handling Div.
   Metraflex Co.
   Sarco Co., Div. of White Consolidated.
   Trerice (H.O.) Co.
   Victaulic Co. of America

D. High Pressure Y-Type Pipeline Strainers:
   1. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 250 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping systems.
   2. Threaded Ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
   3. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted steel retainer with off-center blowdown fitted with pipe plug.
   4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:

      American Air Filter, an Allis-Chalmers Co.
      Armstrong Machine Works.
      Hoffman Specialty, ITT Fluid Handling Div.
      Metraflex Co.
      Sarco Co., Div. of White Consolidated.
      Trerice (H.O.) Co.
      Victaulic Co. of America

E. Dielectric Unions:
   1. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolates ferrous from non-ferrous piping (electrical conductance), present galvanic action, and stop corrosion.
   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dielectric unions which may be incorporated in the work include, but are not limited to, the following:

      Atlas Products Co.
      Capital Mfg. Co., Div. of Harsco Corp.
      Eclipse, Inc.
      Epco Sales, Inc.
      FMC Corp.
      McNally, Inc.
      PSI Industries.
      Stockham Valves and Fittings.

2.02 FABRICATED PIPING SPECIALTIES

A. Drip Pans: Provide drip pans fabricated from not less than 18-gauge corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2 inches. Reinforce top, either by structural angles or by rolling top over 1/4-inch steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

B. Pipe Sleeves: Provide pipe sleeves of one of the following:
   1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with SnapLock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3 inches and smaller, 20-gauge; 4 inches to 6 inches, 16-gauge; over 6 inches, 14-gauge.
   2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
   3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe, remove burrs.

C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
   1. Lead and Oakum: Caulked between sleeve and pipe.
   2. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mechanical sleeve seals which may be incorporated in the work include, but are not limited to following:

   Thunderline Corp.

2.03 VALVES

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.04 GATE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Comply with the following standards.
   1. Cast-Iron Valves: MSS SP-70.
   2. Bronze Valves: MSS SP-80.
   3. Steel Valves: ANSI B16.34.

C. For Domestic Water Service:
   1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, NIBCO T-111-LF (gate valves only).
   2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge, Nibco F-617-0.

D. For Fire Protection Service:
   1. Threaded Ends 2 inches and smaller: Class 200, bronze body, yoke bonnet, rising stem, OS&Y, solid wedge, UL/FM approved, Stockham B-133.
   2. Flanged Ends 2-1/2 inches and larger: Class 200, iron body, bolted bonnet, rising stem, OS&Y, solid wedge, UL/FM approved, Stockham G-634.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following:
   1. Milwaukee Valve Company.
   2. NIBCO Valve Company.
   3. Stockham Valves and Fittings, Inc.

2.05 GLOBE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal seated globe valves, provide hardened stainless-steel disc and seat ring.

C. Comply with the following standard:
   1. Cast-Iron Valves: MSS SP-85.
   2. Bronze Valves: MSS SP-80.
   3. Steel Valves: ANSI B16.34.

D. For Domestic Water Service:
   1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, composition disc, NIBCO No. T-211Y.
   2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body, bronze trimmed, bolted bonnet, rising stem, OS&Y, renewable seat and disc, NIBCO F-718-B.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:
   1. Milwaukee Valve Company.
   2. NIBCO Valve Company.
   3. Stockham Valves and Fittings, Inc.

2.06 DRAIN VALVES

A. For Low Pressure Drainage Service:
   1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4-inch hose outlet connection, Milwaukee 1152M.
   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:
      a. Milwaukee Valve Company.
      b. NIBCO Valve Company.
      c. Stockham Valves and Fittings, Inc.

2.07 BALL VALVES

A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

B. Comply with the following standards:
   1. Steel Valves: ANSI B16.34.

C. For Domestic Water Service:
   1. Threaded Ends 2 inches and smaller: Class 125, bronze 2-piece body, stainless steel ball, bronze, extended stem, Apollo 77c – 14X-04.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball

valves which may be incorporated in the work include, but are not limited to the, the following:
1. Milwaukee Valve Company.
2. NIBCO Valve Company.
3. Stockham Valves and Fittings, Inc.
4. Apollo: 77c-100 Series.

2.08 SWING CHECK VALVES

A. General: Construct pressure containing parts of valves as follows:
   1. Bronze Valves, 125 or 150 psi: ANSI/ASTM B62.
   2. Metallic Seated Bronze Valves, 200 or 300 psi: ANSI/ASTM B61.
   3. Iron Body Valves: ANSI/ASTM A126, Grade B.

B. Comply with MSS SP-71 for design, workmanship, material, and testing.

C. Construct valves of pressure castings free of any impregnating materials.

D. Construct valves of bronze, regrinding, with seating angle 40 degrees to 45 degrees, unless composition disc is specified.

E. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

F. Construct disc and hanger as separate parts, with disc free to rotate.

G. Support hanger pins on both ends by removable side plugs.

H. For Domestic Water Service:
   1. Threaded Ends 2 inches and smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc, NIBCO T-413-Y-LF.
   2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, NIBCO F-918-B.

I. For Fire Protection System:
   1. Threaded Ends 2 inches and smaller: Class 200, bronze body, bolted cap, horizontal swing, composition disc, UL listed, Stockham B-305-B.
   2. Flanged Ends 2-1/2 inches and larger: Class 2005, iron body bronze mounted, bolted cap, horizontal swing, malleable iron disc, UL/FM approved, Stockham G-939.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to, the following:
   1. Milwaukee Valve Company
   2. NIBCO Valve Company.
   3. Stockham Valves and Fittings, Inc.

2.09 VALVE FEATURES

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

B. Bypass: Comply with MSS SP-45, and except as otherwise indicated provide manufacturer's standard bypass piping and valving.

C. Drain: Comply with MSS SP-45, and provide threaded pipe plug complying with Division-15 "Pipe, Tube, and Fittings" section.

D. Flanged: Valve flanges complying with ANSI B16.5 (steel) or ANSI B16.24 (bronze).

E. Threaded: Valve ends complying with ANSI B2.1.

F. Butt-Welding: Valve ends complying with ANSI B16.25.

G. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

H. Wafer: Flangeless valves.

I. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.

J. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.

K. Renewable Seat: Design seat of valve with removable disc, and assembly valve so disc can be replaced when worn.

L. Extended Stem: Increase stem length by 2 inches minimum, to accommodate insulation applied over valve.

M. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment, and chain designed to provide mechanical advantage in operating valve.

N. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union, or welding.

O. Solid Wedge: One-piece tapered disc in gate valve, designed for contact on both sides.

P. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.

2.10 PLUG VALVES (COCKS) (For Complete Gas Valve Specifications See Section 22 1005)

A. Valve body shall be screw pattern, iron, except that sizes 1-1/4 inches through 2 inches shall be semi-steel, rated for 125 psig, non-shock W.O.G. operating pressure.

B. Plug shall be tapered, lubricated brass with square head operator.

C. Approved Manufacturers:
1. 1-inch and smaller - A. Y. McDonnel Manufacturing Company #10686.
2. 1-1/4 inches through 1-1/2 inches - Nordstrom #114.
3. 2-1/2 inches and larger - Nordstrom #115.
4. Architect Approved.

2.11 PRESSURE RELIEF VALVES

A. Body: Bronze or iron with testing lever.

B. Trim: Bronze or stainless steel.

C. Construction: Comply with ASME Code for Pressure Vessels, Section VIII and shall bear ASME stamp.

D. Maximum Permissible over Pressure: 25 percent (water).

E. Approved Manufacturers:
1. Bell and Gossett.
2. McDonnell Miller.
3. Kunkle Valve Company.

2.12 PRESSURE REDUCING VALVES

A. Body: Cast iron.

B. Trim: Bronze.

C. Rating: 125 psig working pressure at 200 degrees F.

D. Operator: Spring loaded diaphragm with adjustable range.

E. Diaphragms and Disc: Nitrile.

F. Pressure Reducing Valves - Water Service:
1. Spence Regulators - Type D 34.
2. Watts Regulators.
3. Architect Approved.

2.13 BACK FLOW PREVENTERS

A. Reduced pressure type. Rated 175 psig at 140 degrees F, manufactured in the United States of America.

B. Body:
1. Bronze construction.
2. Bronze body test cocks.
3. NPT body connections.
4. Non-rising stem gate valves.

C. Check Valve:
1. Celcon seats.
2. Rubber check valve.

D. Relief Valve:
1. Stainless steel seat.
2. Stainless steel shaft and flange bolts.

E. APPROVED MANUFACTURERS
1. Watts Regulator Series 909-SAG.
2. Wilkins Regulators.
3. Febco.

2.14 HORIZONTAL-PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

B. Adjustable Steel Clevises: MSS Type 1.

C. Steel Double Bolt Pipe Clamps: MSS Type 3.

D. Adjustable Swivel Pipe Rings: MSS Type 6.

E. Split Pipe Rings: MSS Type 11.

F. Extension Split Pipe Clamps: MSS Type 12.

G. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.

H. Pipe Stanchion Saddle: MSS Type 37, including steel pipe base support and cast-iron floor flange.

I. Adjustable Pipe Saddle Supports: MSS Type 38 including steel pipe base support and cast-iron floor flange.

J. Single Pipe Rolls: MSS Type 41.

K. Adjustable Roller Hangers: MSS Type 43.

2.15 VERTICAL-PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

B. Two-Bolt Riser Clamps: MSS Type 8.

C. Four-Bolt Riser Clamps: MSS Type 42.

2.16 HANGER-ROD ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

B. Steel Turnbuckles: MSS Type 13.

C. Swivel Turnbuckles: MSS Type 15.

D. Malleable Iron Sockets: MSS Type 16.

E. Steel Weldless Eye Nuts: MSS Type 17.

2.17 BUILDING ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

B. Concrete Inserts: MSS Type 18.

C. Top Beam C-Clamps: MSS Type 19.

D. Side Beam or Channel Clamps: MSS Type 20.

E. Center Beam Clamps: MSS Type 21.

F. C-Clamps: MSS Type 23.

G. Top I-Beam Clamps: MSS Type 25.

H. Side I-Beam Clamps: MSS Type 27.

I. Steel I-Beam Clamps with Eye Nut: MSS Type 28.

J. Steel WF-Beam Clamps with Eye Nut: MSS Type 29.

K. Malleable Beam Clamps: MSS Type 30.

L. Steel Brackets: One of the following for indicated loading:

Light Duty: MSS Type 31.
Medium Duty: MSS Type 32.
Heavy Duty: MSS Type 33.

2.18 SADDLES AND SHIELDS

A. General: Except as otherwise indicated, provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Side saddles and shields for exact fit to mate with pipe insulation.

B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

2.19 MANUFACTURERS OF HANGERS AND SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hangers and supports which may be incorporated in the work include, but are not limited to the following:
C & S Mfg. Corp.
Carpenter and Patterson, Inc.
Elcen Metal Products Co.
F & S Central Mfg. Corp.
ITT Grinnell Corp.

2.20 MISCELLANEOUS MATERIALS

A. Metal Framing: Provide products complying with NEMA Std. ML 1.

B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A36.

C. Cement Grout: Portland cement (ANSI/ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C404, Size No. 2). Mix at a ratio of 1.0-part cement to 3 parts sand, by volume, with minimum amount of water required for placement and hydration.

D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for load required; weld steel in accordance with AWS standards.

E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), by cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 EXECUTION

3.01 INSTALLATION OF MANUFACTURED PIPING SPECIALTIES

A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2 inches and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment.

Pumps.
Steam traps serving steam main drips.
Temperature control valves.

Pressure reducing valves.
Temperature or pressure regulating valves.

C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.02 INSTALLATION OF FABRICATED PIPING SPECIALTIES

A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1 inch drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

B. Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less that 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface except floor sleeve. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
   1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
   2. Install iron-pipe sleeves at exterior penetrations, both above and below grade.
   3. Install steel-pipe sleeves except as otherwise indicated.

C. Sleeve Seals: Install in accordance with the following:
   1. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

3.03 INSTALLATION OF VALVES

A. General: Except as otherwise indicated, comply with the following requirements.
   1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
   2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
   3. Ball valves shall not be substituted for gate valves or plug valves. Install ball valves only where shown on the Drawings.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

E. Mechanical Actuators: Install mechanical actuator with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler

rooms; and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.

F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections.
   1. Pipe Size 2 inches and smaller: One of the following, at Installer's option:
      a. Threaded valves.
      b. Grooved-end valves (Fire Protection Only).
      c. Flanged valves.
   2. Pipe Size 2-1/2 inches and larger: One of the following, at Installer's option:
      a. Grooved-end valves (Fire Protection Only).
      b. Flanged valves.

G. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

H. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

I. Renewable Seats: Select and install valves with renewable seats except where otherwise indicated.

J. Fluid Control: Except as otherwise indicated, install, gate, ball, globe and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valve.

K. Installation of Check Valves:
   1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
   2. Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
   3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
   4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.

3.04 INSTALLATION OF BACKFLOW PREVENTERS

A. Install backflow preventers where shown on the plans with elbow and air gap, and as may be required to prevent cross contamination of potable water systems.

B. Pipe discharge drain to nearest floor drain.

3.05 PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

B. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.06 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations, within concrete or on structural steel for proper

piping support. Space attachments within maximum piping span length indicated in MSS SP-59. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.07 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
   1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
   2. Support fire-water piping independently of other piping.
   3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

B. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion bends and similar units.
   2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
   3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Insulated Piping: Comply with the following installation requirements.
   1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
   2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install galvanized coated protective shields. Install Foam-Glas insulation saddles.
   3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.08 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximum recommended by manufacturer for each unit.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.09 ADJUSTMENT OF HANGERS AND SUPPORTS

A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

3.10 EQUIPMENT BASES

A. Concrete housekeeping bases will be provided as work of Division 3. Furnish to Contractor, scaled layouts of all required b bases with dimensions of bases, and location to column center lines. Furnish templates, anchor bolts, and accessories, necessary for base construction.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Structural steel stands to be supported from housekeeping pad bases. Steel supports shall not be allowed to be in direct contact with slab floors.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for complete heating, ventilating, and air conditioning system.

1.02 RELATED SECTIONS

A. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

B. Section 23 21 13 – Hydronic Piping.

C. Section 23 31 00 – HVAC Ducts and Casings.

D. Division 23 – All Sections.

E. Section 31 23 16 – Excavation.

1.03 SITE CONDITIONS

A. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.

B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.04 SCOPE

A. Includes:
1. Labor, materials and equipment necessary for completion of work unless indicated or noted otherwise.
2. Installation of complete heating, ventilation and air conditioning systems.
3. Providing motors specified in this Division and be responsible for proper operation of electrical power equipment furnished by this Division.
4. Furnish exact location of electrical connections and completed information on motor controls to Division 26.
5. Putting heating, ventilating, cooling and exhaust systems into full operation during each working day of testing and balancing.
6. Making changes in pulleys, belts and dampers or adding dampers as required for correct balance.

B. Related Work Specified Elsewhere:
1. Conduit (unless specified otherwise), line voltage wiring, outlets and disconnect switches specified in Division 26.
2. Magnetic starters and thermal protective devices (heaters) not a factory mounted integral part of packaged equipment are specified in Division 26.

1.05 SITE INSPECTION

A. Examine premises and understand the conditions which may affect performance of work

of this Division before submitting proposals for this work.

B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.06 DRAWINGS

A. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.

C. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and

D. Record difference between mechanical work as installed and as shown in Contract Documents on a set of prints of mechanical drawings to be furnished by Engineer. Return these prints to Engineer at completion of project. These will be labeled "Contractor Revised Drawings".

1.07 SUBSTITUTIONS

A. The naming of specified items on the drawings or in the specifications is intended to establish a level of quality and performance. Substitution requests may be submitted at the time of shop drawing submittal. Review of substituted equipment or material prior to the Bid Date will not be considered unless otherwise specified.

B. Substitution shall be submitted as specified in Division 0.

1.08 CODE REQUIREMENTS, FEES & PERMITS

A. Perform work in accordance with applicable provisions of state and local Plumbing Code, gas ordinances and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations and ordinances.

B. In case of differences between building codes, state laws, local ordinances, utility company regulations and Contract Documents, the most stringent shall govern. Promptly notify Engineer in writing of such differences.

1.09 COORDINATION OF WORK

A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to Architect. Should conditions arise where certain changes would be advisable, secure Architect's approval of these changes before proceeding with work.

B. Coordinate work of various trades in installing inter-related work. Before installation of mechanical items, make proper provisions to avoid interferences in a manner approved by

Architect. Changes required in work specified in Division 23 caused by neglect to do so shall be made at no cost to Owner.

C. Provide inserts and supports required by Division 23 unless otherwise noted. Furnish sleeves, inserts, supports and equipment that are an integral part of other divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location of installation of items above shall be borne by Division 23.

D. Be responsible for required digging, cutting and patching incident to work of this Division and make required repairs afterward to satisfaction of Engineer. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns or trusses.
   1. Each Section of this Division shall bear expense of cutting, patchin repairing and replacing of work of other Sections required because of its fault, error, tardiness or because of damage done by it.
   2. Cutting, patching, repairing and replacing pavements, sidewalks, roads and curbs to permit installation of work of this Division is responsibility of Section installing work.

E. Adjust locations of pipes, etc. to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
   1. Make offsets, transitions, and changes in direction of pipes, as required to maintain proper headroom and pitch of sloping lines whether or not indicated on Drawings.

F. Slots and openings through floors, walls, ceilings and roofs shall be provided by other Divisions in their respective materials. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.10 CLEANING AND FINISHING

A. Clean exposed piping, ductwork, and equipment. Repair damaged finishes and leave everything in working order satisfactory to Engineer.

1.11 LUBRICATION

A. Properly lubricate equipment before Owner's acceptance.

B. Provide lubricating chart listing each item of equipment, type of lubricant required and frequency of lubrication.

1.5 EXCAVATION AND TRENCHING FOR PIPING

A. Excavate to the depths indicated on the Drawings or as otherwise specified. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulated therein shall be removed by pumping or by other approved method. Do sheeting and shoring as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of trench may be tunneled if the pipe can be safety and properly installed and backfill can be properly tamped in such tunnel sections.

B. Trench Excavation: Bottom of trench for tile or concrete pipe shall be rounded so that at least the bottom quadrant of the pipe rests firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. Grade bottom of trenches to

provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered, excavate to a minimum overdepth of 4 inches below trench depths indicated on the drawings or specified. Overdepths in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered, such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.

C. Depth of Cover: Trenches shall be of depth that will provide a minimum depth of cover of three feet for water, sanitary and storm sewer and two feet for gas piping from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

D. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the drawings, or the locations of which are made known to the contractor prior to excavation, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the contractor, at his expense.

1.12 BACKFILLING OF TRENCHES

A. Trenches shall not be backfilled until required pressure and other tests have been performed, inspection of utility and Code officials have been accomplished, and until the utilities systems as installed conform to requirements of drawings and specifications.

B. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones over 2-1/2-inch maximum dimension, deposited in 6-inch layers and compacted to 95% of the maximum laboratory density determined in accordance with ASTM D-698, Moisture-Density Relation of Soils. Tests for maximum density will be made with expense borne by contractor. If fills fail to meet the specified densities, the contractor shall remove and recompact the fill until specified densities are achieved.

C. Tests for Displacement of Pipes: After the trench has been backfilled to 2 feet or more above the pipe, if the pipe shows poor alignment, displaced pipe, or any other defects, such defects shall be remedied by the contractor at his expense.

1.13 GENERAL PIPING INSTALLATION

A. Furnish and install a complete system of piping, all valved as indicated or as necessary to completely control the entire system. The piping drawings are diagrammatic and indicate the general location and connections. If the size of any piping is not clearly evident, obtain instructions from the Engineer before proceeding with the work. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the contractor from responsibility for the proper erection of systems of piping in every respect suitable for the work intended. Piping systems that are not to be installed complete shall be so noted.

B. Erection: Piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Remove all burrs and cutting slag by reaming or other cleaning methods. Changes in direction shall be made with fittings, except that bendings of pipe will be permitted, providing a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformation will not be acceptable. Piping shall be arranged so as not to interfere with removal of other

equipment or devices nor to block access to doors, windows, manholes or other access openings. Piping shall be installed to ensure noiseless circulation. Valves and specialties shall be placed to permit easy operation and access, and valves shall be regulated, packed and glands adjusted at the completion of the work before final acceptance. Piping shall be installed so as to avoid liquid or air pockets. Eccentric reducers shall be used wherever changes in pipe sizes occur in hot water and chill water mains. Locate reducers approximately 18 inches beyond the nearest upstream branch.

C. Expansion and contraction of piping shall be provided by expansion loops, bends or expansion joints to prevent injury to connections, piping, equipment or the building.

D. Minimum slope of piping shall be in accordance with the following unless otherwise specifically shown on the drawings or specified:

Type of Piping			Length for Direction
Fluid Conveyed	System Component	1" Fall	of Fall
Heating Water Chilled Water	Runouts to fan coil units or risers	4 feet	Back to mains
Heating Water Chilled Water Condenser Water	Supply and return mains	Level	
Domestic Water	Main or branch	40 feet	Back to mains

E. Unions shall be installed on bypasses, ahead of traps, at connections to equipment, where shown on drawings, or where required to facilitate removal of equipment whether shown or not.

F. Escutcheons shall be provided where pipes are exposed in finish locations of the building and run through walls, floors, or ceiling. Plates shall be chrome plated spun brass of plain pattern and shall be set tight on the pipe and to the building surface.

G. Protection: Open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the system. Plugs of rags, wood, cotton, concrete, waste or similar materials must not be used in plugging.

H. Installation of Underground Pipe: Bottom of trench shall be shaped to give substantially uniform circumferential support to lower third of each pipe. Pipe shall be laid true to line and grade in such manner as to form a close concentric joint with adjoining pipe and to prevent sudden offsets to flow line. As work progresses, interior of pipe shall be cleared of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe size, a suitable swag or drain shall be kept in pipe and pulled forward past each joint immediately after jointing has been completed. Trenches shall be kept free from water until pipe jointing has set and pipe shall not be laid when condition of trench or weather is unsuitable for such work.

I. Cleaning and Flushing: Contractor shall take every precaution to remove dirt, grease, and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be flushed with clean water except where specified otherwise.

J. A temporary flushing connection shall be arranged for each section of piping and flushing arranged for all piping. Water required for flushing and testing shall be furnished by the contractor. Temporary cross connections for flushing and drainage connections shall be furnished, installed, and subsequently removed by the contractor.

K. Pipe Sizes: If the size of any piping is not clearly evident in the drawings, the contractor shall request instructions from the Engineer as to the proper sizing. Any changes resulting from the contractor's failure to request clarification shall be at his expense.

1.14 THERMAL AND MOISTURE PROTECTION

A. Install all insulation products in accordance with manufacturer's written instructions and in accordance with industry practices to ensure that insulation serves its intended purpose.

B. Insulate all piping, ducts and equipment, whether indicated or not, which are subject to freezing or condensation formation.

C. Insulate tops of all ceiling mounted air devices and the body of all side-wall mounted air devices with a minimum of 1/2 inch thick fiberglass blanket.

D. Insulate all piping, ducts and equipment, whether indicated or not, whose normal operating surface temperature exceeds 120^{o}F unless specifically noted otherwise.

E. Insulation and vapor barrier shall be continuous throughout the system unless specified otherwise.

F. Install flashing, counterflashing and caulk or seal all penetrations in roof, exterior walls or floors as required to prevent exterior moisture from entering building.

G. Install all piping located in exterior walls, attic spaces or crawl spaces on the room side of the building insulation to prevent freezing.

H. Provide heat trace cable on all water piping above grade outdoors which is subject to freezing whether insulated or note. Cable shall be installed in strict accordance with the manufacturer's installation instructions.

1.15 EQUIPMENT AND MATERIALS

A. Product Approvals:
1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in specification.

B. Use domestic made pipe, pipe fittings and motors on project.

C. Motor and equipment name plates as well as applicable UL and AGA labels shall be in place before pre-final inspection.

D. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connection and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.

E. Follow Manufacturer's directions in delivery, storage, protection and installation of equipment and materials.
   1. Promptly notify Architect in writing of conflicts between requirements of Contract Documents and manufacturer's directions and obtain Architect's written instructions before proceeding with work. Bear expenses arising from correcting deficiencies of work that do not comply with Manufacturer's directions or such written instructions from Architect.

F. Deliver equipment and material to site and tightly cover to protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.16 OPERATIONS AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS

A. Bind two (2) Operations & Maintenance Manuals for Mechanical Systems in 3-ring, hardback binders. Spline of each binder shall have the following lettering done in silk-screen -

OPERATION AND MAINTENANCE MANUAL
for MECHANICAL SYSTEMS OF
SCHICHTL HALL RENOVATIONS
UNIVERSITY OF CENTRAL ARKANSAS
CONWAY, ARKANSAS

   1. Provide a master index at beginning of Manual showing items included. Include name and phone number of nearest supplier and Manufacturer's representative. Use plastic tab indexes for sections of Manual.
   2. Step by step procedure to follow in putting each piece of mechanical equipment into operation.
   3. Provide schematic control diagrams for each separate fan system, refrigeration system, heating system, control panel, etc. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gages, automatic valves and refrigeration accessories. Mark correct operating settings for each control instrument on these diagrams.
   4. Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches and relays.
   5. Provide drawings of each temperature control panel identifying components on the panels and their function.

B. Maintenance instructions shall include:
   1. Manufacturer's maintenance instructions for each piece of mechanical equipment installed in project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operations instructions of equipment and maintenance and lubrication instructions.
   2. Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
   3. List of mechanical equipment used to indicate name, model, serial number and nameplate data of each item together with number and name associated with each system item.

C. Air Balance and Test Run Reports.
   1. Include a copy of air balance reports and certifications.

2. Include a copy of the 3-day operating test data.

D. Provide a complete set of approved shop drawing submittals as an Appendix item.

1.17 OPERATIONS AND MAINTENANCE INSTRUCTIONS

A. Instruct Owner/Owner's Representative in operation and maintenance of mechanical systems utilizing Operations and Maintenance Manual when so doing.

B. Minimum instruction periods shall be as follows:
1. Mechanical - Sixteen (16) hours.
2. Temperature Controls - Sixteen (16) hours.

C. Instruction periods shall occur after pre-final inspection when systems are properly working and before final payment is made.

D. None of these instructional periods shall overlap another.

1.18 CONTRACTOR REVISED DRAWINGS

A. The contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.

B. Exact location of all underground utility service entrances and their connections to utility mains, terminal boxes, piping and all valves, etc., which will be concealed in the finished work shall be accurately indicated on the drawings by measured distances.

C. Upon completion of the work and prior to final payment, the contractor shall furnish to the Engineer, one set of "contractor revised" prints, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

D. Contractor shall include all addendum items and field change order information on the revised drawings. Revise all schedules shown on the drawings to reflect the actual model numbers, capacities and electrical characteristics of substituted equipment.

1.19 VISIT SITE

A. This contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause for extras after the contract is signed by reason of unforeseen conditions. Any existing electric wiring and conduit, gas, water drainage piping encountered within the building area shall be relocated or removed where required by this contractor at no extra cost to the Owner.

1.20 GUARANTEE

A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or in the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.

B. The Contractor shall, after completion of the original test of the installation, and acceptance of the Engineer, provide any service incidental to the proper performance of the mechanical systems under guarantees outlined above for a period of one (1) year.

1.21 REVIEW OF MATERIALS AND EQUIPMENT

A. Furnish complete catalog data for manufactured items of equipment to be used in Work to Architect for review within 30 days after award of Contract.

B. Submit six (6) copies of data in 3-ring binders with tab indices in same order and name as they appear in specification.

1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions and other pertinent information. Pertinent information shall include as a minimum those items as scheduled on the drawings. Arrange submittal information to reflect these categories scheduled on the drawings.
2. Provide an index of tab numbers at the front of each binder. List the specification number and category included under each tab as described in the specifications and as scheduled on the drawings.
3. Provide cover sheet for each tab section. List each piece of equipment by name, model number and supplier.
4. Underline applicable data and indicate model being supplied on each submittal sheet.

C. If data is not submitted as specified or submittal is not complete, it will be returned without review.

D. Catalog data or shop drawings for equipment which are noted as being reviewed by the Architect, shall not supersede Contract Documents.

E. Review comments of Architect shall not relieve this Division from responsibility for deviations from Contract Documents unless Architects' attention has been called to such deviations in writing at the time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

F. Check work described in catalog data with Contract Documents for deviations and errors.

1.22 FINALLY

A. It is the intention that this specification shall provide a complete installation except as hereinbefore specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included.

B. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

PART 2 PRODUCTS

2.01 PRODUCTS AND MATERIALS

A. Products or materials containing iron or steel shall originate in the USA in accordance with Section 1605 of the American Recovery and Reinvestment Act of 2009.

2.02 HEAT TRACE TAPE

A. Cable shall be 120-volt, single phase, braided and jacketed, self-regulating cable for low temperature applications. Manufacturer shall provide system design and installation drawings for the heat trace system.

B. Cable construction shall be as follows:
1. Buss Wires: Twin #16 AWG copper.
2. Matrix: Semi-conductive polymer core whose electrical resistance varies with temperature.
3. Jacket: Flame retardant insulation of thermoplastic.
4. Braid: Tinned copper.
5. Capacity: Calculated based on service pipe type and insulation thickness. Submit calculation for approval.

2.03 APPROVED MANUFACTURERS

A. Chromalox: Model SRL.

B. Engineer Approved.

PART 3 EXECUTION

3.01 Install heat trace cable in strict accordance with the manufacturer's instructions.

3.02 Coordinate electrical power and disconnect requirements with Division 26.

3.03 Provide power connection kits, end seals, tees, ambient sensing thermostats and all required accessories for a complete installation.

END OF SECTION

SECTION 23 0501
MECHANICAL DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work specified in this section.

1.02 DESCRIPTION OF WORK

A. The extent of general demolition work is shown on drawings. Coordinate the required mechanical and plumbing work with the general demolition.

B. Demolition includes removal of systems and removal and disposal of demolished materials, as shown on drawings and herein specified.

C. The Owner shall have the option of retaining any items removed. The Contractor shall deliver these items to the Owner's designated storage area. Any items not retained by the Owner shall be disposed of off-site by the Contractor.

1.03 JOB CONDITIONS

A. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.
   1. Conditions of the structure existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work. The drawings are schematic and provided as an aid in bidding. The contractor shall visit the site and determine the actual conditions prior to bidding.

B. Partial Removal: Items of salvable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.
   1. Storage or sale of removed items on site will not be permitted.

C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, occupied areas, and other adjacent occupied or used facilities.

D. Protections: Ensure safe passage of persons around or through area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
   1. Install temporary mechanical services, plumbing, temperature control, etc., as required by the Owner or authorities having jurisdiction.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

F. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Allow no interruption in service unless coordinated with Owner at least 24 hours in advance.
   1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary

services during interruptions to existing utilities, as acceptable to governing authorities.

2. Contractor will disconnect and seal utilities serving each structure to be demolished, or interior area to be demolished, prior to start of demolition work.

G. If Contractor is required to disconnect utility services or other services to an occupied area, the Contractor shall provide temporary or alternative service to that area, as required by Owner.

PART 2 PRODUCTS
(Not applicable)

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove all equipment, piping, etc., as indicated on the drawings.

B. All items shown to remain active shall be furnished with necessary devices or accessories.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove from site debris, rubbish, and other materials resulting from demolition operations. Pay all fees related to removal and dumping.

1. Burning of removed materials from demolished structures will not be permitted on site.

B. Removal:

1. Transport materials removed from demolished structures and dispose of off site.

END OF SECTION

SECTION 23 0513
COMMON ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section specifies the basic requirements for electrical components which are an integral part of packaged HVAC equipment. These components include, but are not limited to factory installed motors furnished as an integral part of plumbing equipment.

B. This section specifies the basic requirements for electrical components required to be furnished under Division 23, which are to be turned over to and installed by Division 26. These components include but are not limited to motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for plumbing equipment are scheduled on the drawings.

1.02 RELATED SECTIONS

A. Section 23 2113 – Hydronic Piping.

B. Section 23 2123 – Hydronic Pumps.

C. Section 23 3423 – HVAC Power Ventilators.

D. Section 23 3813 – Kitchen Ventilation System.

E. Section 23 6116 – Centrifugal Chillers.

F. Section 23 3616 – Air Terminal Units – Variable Volume.

1.03 REFERENCES

A. NEMA Standards MG-1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70).

F. Compliance and Labeling: Provide motors and starters which have been listed and labeled by a nationally recognized testing facility engaged in and equipped to test electrical equipment and materials.

1.04 SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

A. Electrical components and materials shall be UL labeled.

PART 2 PRODUCTS

2.01 MOTORS

A. The following are basic requirements for simple or common motors, for special motors, more detailed and specific requirements are specified in the individual equipment specifications.
   1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
   2. Motor sizes shall be large enough so that driven load will not requirement the motor to operate in the service factor range.
   3. 2-speed motors shall be 2 separate windings on polyphase motors.
   4. Temperature Rating: Rated for 40 deg. environment, with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).
   5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly timed spaced starts per hour for manually controlled motors.
   6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
   1. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
   2. Bearings:
      a. Ball or roller bearings with inner and outer shaft seals;
      b. Regreasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
      c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
      d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
   3. Enclosure Type:
      a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;
      b. Guarded drip-proof motors where exposed to contact by employees or building occupants;
      c. Weather protected Type I for outdoor use, Type II where not housed;
   4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
   5. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.
   6. Efficiency: Provide "Energy Efficient" motors with a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a minimum efficiency as listed below.

1HP	80% Eff'y	10HP	87%
1-1/2 to 2HP	82%	15HP	89%
3HP	83%	20HP	90%
5HP	84%	25HP and up	91%

7-1/2 HP	85%

C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
Baldor Electric Co.
Century Electric, Inc.
General Electric Co.
Marathon Electric Mfg. Co.
Reliance Electric Co.
Westinghouse Electric Corp.

D. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 23 0515
VARIABLE FREQUENCY MOTOR CONTROLS – BUILDINGS AND HVAC

PART 1 GENERAL

1.01 DESCRIPTION

A. This specification is to cover a complete Variable Frequency Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use with both asynchronous and permanent magnet motors.

B. The drive manufacturer shall supply the drive and all necessary options as specified. All drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). The manufacturer shall have been engaged in the production of this type of equipment for a minimum of 5 years. Drives that are manufactured by a third party and “brand labeled” shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a “brand labeled” drive.

C. This specification is intended to supplement a drive schedule. The drive schedule identifies the optimized BOM for the project and includes quantity, size, voltage, enclosure rating, options, and harmonic mitigation requirements of the drives. IEEE 519-2014 is an electrical system standard for harmonic mitigation and not intended to be applied to an individual piece of equipment. Drives are only one of many sources of harmonics, thus verification of system IEEE 519-2014 compliance is beyond the VFD manufacturer’s scope.

1.02 QUALITY ASSURANCE

A. Referenced Standards and Guidelines:
   1. Institute of Electrical and Electronic Engineers (IEEE)
      a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
   2. Underwriters Laboratories (as appropriate)
      a. UL 508, 508A, 508C
      b. UL 61800, 61800-5-1, 61800-5-2
      c. UL 1995
   3. The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA)
      a. NEMA ICS 7-2014, Adjustable Speed Drives
   4. International Electrotechnical Commission (IEC)
      a. EN/IEC 61800
   5. National Electric Code (NEC)
      a. NEC 430.120, Adjustable-Speed Drive Systems
   6. CSA Group
      a. CSA C22.2 No. 274
   7. International Building Code (IBC)
      a. IBC 2018 Seismic – referencing ASCE 7-16 and ICC AC-156

B. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base VFD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.
2. CE Mark – The base drive shall conform to the European Union Electromagnetic Compatibility directive, a requirement for CE marking. The base drive shall meet product standard EN 61800-3 for the First Environment restricted distribution (Category C2).
3. The base drive shall be seismically certified and labeled as such in accordance with the 2018 International Building Code (IBC):
   a. Seismic importance factor of 1.5, and minimum 2.5 SDS rating is required.
   b. Ratings shall be based upon actual shake test data as defined by ICC AC-156, via all three axis of motion.
   c. Seismic certification of equipment and components shall be provided by OSHPD preapproval.
4. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.

1.03 SUBMITTALS

A. Submittals shall include the following information:
   1. Outline dimensions, conduit entry locations and weights.
   2. Customer connection and power wiring diagrams.
   3. OSHPD preapproval, seismic certification and installation requirements where applicable.
   4. Complete technical product description with complete list of options provided. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification.
   5. Building Information Modeling (BIM) objects shall be available online.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ABB (ACH 580 Series).
B. Danfoss.
C. Yaskawa.

Note: No other alternate manufacturers will be accepted.

2.01 VARIABLE FREQUENCY DRIVES

A. The drive package as specified herein and defined on the drive schedule shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer to ISO9001 standards.

B. The drive shall provide full rated output from a line of +10% to -15% of nominal voltage. The drive shall continue to operate without faulting from a line of +25% to -35% of nominal voltage.
   1. Drives shall be capable of continuous full load operation under the following environmental operating conditions:
      a. Ambient temperature -15 to 40° C (5 to 104° F).
      b. Altitude 0 to 1000 m (0 to 3,300 ft) above sea level.
      c. Humidity 5 to 95%, non-condensing.

C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.
   1. Plain English text
      a. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable).
      b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.
      c. Safety interlock, run permissive, and external fault status shall have the option of additional customized project specific terms, such as: AHU-1 End Switch, Office Smoke Alarm, CT-2 Vibration.
   2. The control panel shall include at minimum the followings controls:
      a. Four navigation keys (Up, Down, Left, Right) and two soft keys to simplify operation and programming.
      b. Hand-Off-Auto selections and manual speed control without having to navigate to a parameter.
      c. Fault Reset and Help keys. The Help key shall include assistance for programming and troubleshooting.
   3. Multiple Home View screens shall be capable of displaying up to 21 points of information. Customizable modules shall include bar charts, graphs, meters, and data lists. Displays shall provide real time graphical trending of output power, frequency, and current within selectable intervals of 15/30/60 minutes and 24 hours.
   4. The control panel shall display the following items on a single screen; output frequency, output current, reference signal, drive name, time, and operating mode (Hand vs Auto, Run vs Stop). Bi-color (red/green) status LED shall be included. Drive (equipment) name shall be customizable.
   5. There shall be a built-in time clock in the control panel. The clock shall have a battery backup with 10 years minimum life span. Daylight savings time shall be selectable.
   6. I/O Summary display with a single screen shall indicate and provide:
      a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs. Drives that require access to internal or live components to measure these values, are not acceptable.
      b. The programmed function of all analog inputs, analog outputs, digital inputs, and relay outputs.
      c. The ability to force individual digital I/O high or low and individual analog I/O to desired value, for increased personal protection during drive commissioning and troubleshooting. Drives that require access to internal or live components to perform these functions, are not acceptable.
   7. The drive shall automatically backup parameters to the control panel. In addition to the automatic backup, the drive shall allow two additional unique backup

parameter sets to be stored. Backup files shall include a time and date stamp. In the event of a drive failure, the control panel of the original drive can be installed on the replacement drive, and parameters from that control panel can be downloaded into the replacement drive.

8. The control panel shall display local technical support contact information as part of drive fault status.
9. The control panel shall be removable, capable of remote mounting.
10. The control panel shall have the ability to store screen shots, which are downloadable via USB.
11. The control panel shall have the ability to display a QR code for quick access to drive information.
12. The LCD screen shall be backlit with the ability to adjust the screen brightness and contrast, with inverted contrast mode. A user-selectable timer shall dim the display and save power when not in use.
13. The control panel shall include assistants specifically designed to facilitate start-up. Assistants shall include: First Start Assistant, Basic Operation, Basic Control, and PID Assistant.
14. Primary settings for HVAC shall provide quick set-up of all parameters and customer interfaces to reduce programming time.
15. The drive shall be able to operate with the control panel removed.

D. All drives shall have the following hardware features/characteristics as standard:
Two (2) programmable analog inputs shall accept current or voltage signals. Current or

1. Voltage selection configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.
2. Two (2) programmable analog outputs. At least one of the analog outputs shall be adjustable for current or voltage signal, configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.
3. Six (6) programmable digital inputs. All digital inputs shall be programmable to support both active high and active low logic, and shall include adjustable on/off time delays. The digital input shall be capable of accepting both 24 VDC and 24 VAC.
4. Three (3) programmable Form-C relay outputs. The relay outputs shall include programmable on/off time delays. The relays shall be rated for a continuous current rating of 2 Amps. Maximum switching voltage of 250 VAC / 30 VDC. Open collector and Form-A relays are not acceptable. Drives that have less than (3) Form-C relay outputs shall provide an option card to provide additional relay outputs.
5. Drive terminal blocks shall be color coded for easy identification of function.
6. The drive shall include an isolated USB port for interface between the drive and a laptop. A non-isolated USB port is not acceptable.
7. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.
8. At a minimum, the drives shall have internal impedance equivalent to 5% to reduce the harmonics to the power line. 5% impedance may be from dual (positive and negative DC link) chokes, or AC line reactor. Drives with only one DC link choke shall add an AC line choke integral to the drive enclosure. Reference the drive schedule to determine if additional harmonic mitigation is required for the system to comply with IEEE 519-2014.
9. The drive shall have cooling fans that are designed for field replacement. The primary cooling fan shall operate only when required and be variable speed for

increased longevity and lower noise levels. Drives whose primary cooling fans are not variable speed, shall include a spare cooling fan.

10. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute. The minimum current rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.
11. The input current rating of the drive shall not be greater than the output current rating. Per NFPA 70 430.122, drives with higher input current ratings may require the upstream wiring, protection devices, and source transformers to be upsized.
12. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.
13. Earth (ground) fault detection shall function in both modulating (running) and non-modulating modes.
14. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition. Drives that do not include coordinated AC transient surge protection shall include an external TVSS/SPD (Transient Voltage Surge Suppressor/Surge Protection Device).
15. The drive shall include a robust DC bus to provide short term power-loss ride through. The DC bus Joule to drive kVA ratio shall be 4.5 J/kVA or higher. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. All drives shall have the following software features as standard:
   1. A Fault Logger that stores the last 16 faults in non-volatile memory.
      a. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.
      b. The date and time of each fault and fault reset attempt shall be stored in the Fault Logger.
   2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory.
      a. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, and automatic reset of a fault.
      b. The date and time of each event's start and completion points shall be stored in the Event Logger.
   3. Programmable start method. Start method shall be selectable based on the application: Flying-start, Normal-start, and Brake-on-start.
   4. Programmable loss-of-load (broken belt / coupling) indication. Indication shall be selectable as a control panel warning, relay output, or over network communications. This function to include a programmable time delay to eliminate false loss-of-load indications.
   5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts." Heating functions based only on "percent current" are not acceptable.
   6. Advanced power metering abilities shall be included in the drive. Drives without these data points, must include a separate power meter with each drive.
      a. Instantaneous output power (kW)

b. Total power, broken down by kWh, MWh, and GWh units of measurement. Power meters that only display kWh and roll over or "max out" once the maximum kWh value is reached, are not acceptable. There shall be resettable and non-resettable total power meters within the drive.
c. Time based kWh metering for: current hour, previous hour, current day, and previous day.
d. Energy saving calculation shall be included that shows the energy and dollars saved by the drive.

7. The drive shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.
8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command, the Drives shall provide a dry contact closure that will signal the damper to open. When the damper is fully open, an end-switch shall close, allowing the drive to run the motor.
   a. The drive shall also include a programmable start delay, for when an end-switch is not provided.
9. Start interlock circuit - Four separate start interlock (safety) inputs shall be provided. When any safety is opened, the motor shall be commanded to stop. The control panel will display the specific safety(s) that are open. The status of each safety shall be transmitted over the network communications. Wiring multiple safeties in series is not acceptable.
10. External fault circuit – Three separate external fault inputs shall be provided. This circuit shall have the same features and functionality as the start interlock circuit, except it shall require a manual reset before the drive is allowed to operate the motor.
11. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature, and allows higher switching frequency settings without derating the drive. It shall be possible to set a minimum and a target switching frequency.
12. Visual function block adaptive programming allowing custom control schemes, minimizing the need for external controllers. i.e., cooling tower staging logic. A free software tool shall be used to configure adaptive programming.
13. The ability to automatically restart after an over-current, over-voltage, under-voltage, external fault, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable. Each of these faults may have automatic restart individually disabled via a parameter selection.
14. Three (3) programmable critical frequency lockout ranges to prevent the drive from operating the load continuously at an unstable speed/load.
15. Seven (7) programmable preset frequencies/speeds.
16. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
17. PID functionality shall be included in the drive.
    a. Programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped based on the level of a process feedback signal.
    b. The drive shall include an independent PID loop for customer use, assigned to an Analog Output. This PID loop may be used for cooling tower bypass valve control, chilled water valve, etc.

18. At least 4 parameter user sets that can be saved to the permanent memory and recalled using a digital input, timed function, or supervision function.
19. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source, allowing the drive control to remain powered by a UPS during an extended power outage.
20. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.
21. The drive shall include a fireman's override mode. Upon receipt of a contact closure from the Fire Alarm Life Safety system, the drive shall operate in a dedicated Override mode distinct and separate from the drive's Normal operation mode. The following features will be available in the drive override function:
    a. The Override mode shall be secured by password to prevent changes once programmed.
    b. The drive shall ignore external inputs and commands not defined as part of the override function.
    c. Override operation mode shall be selectable between: single frequency, multiple fixed frequencies, follow an analog input signal, PID control, or come to a forced stop.
    d. High priority safeties shall stop the drive and lower priority safeties shall be ignored in Override mode.
    e. Drive faults shall be defined in Critical and Low priority groups. Critical faults shall stop the drive. Low priority faults shall be reset. Reset trials and timing shall be programmable.
    f. The drive shall be configurable to receive from 1 to 3 discrete digital input signals and operate at up to three discrete speeds.
22. The drive shall have multi-pump functionality and an intelligent master/follower configuration for controlling up to 8 parallel pumps equipped with drives. The drive shall have a parameter synchronization feature to program the PID, multi-pump, and AI parameters in all parallel drives. The functionality to start and stop the pumps based on capacity, operating time or efficiency of the pump to ensure each pump is operated regularly.
    a. The multi-pump functionality shall control:
        1) Flow Control
        2) Pressure Control
        3) Pump Alternation

F. Security Features
1. The drive manufacture shall clearly define cybersecurity capabilities for their products.
2. The drive shall include password protection against parameter changes.
    a. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.
    b. The drive shall support a customer generated unique password between 0 and 99,999,999.
    c. The drive shall log an event whenever the drive password has been entered.
    d. The drive shall provide a security selection that prevents any "back door" entry. This selection even prevents the drive manufacturer from being able to bypass the security of that drive.

e. A security level shall be available that prevents the drive from being flashed with new firmware.

3. A checksum feature shall be used to notify the owner of unauthorized parameter changes made to the drive. The checksum feature includes two unique values assigned to a specific programming configuration.
   a. One checksum value shall represent all user editable parameters in the drive except communication setup parameters. A second checksum value shall represent all user editable parameters except communication setup, energy, and motor data parameters.
   b. Once the drive has been commissioned the two values can be independently saved in the drive.
   c. The drive shall be configurable to either: Log an Event, provide a Warning, or Fault upon a parameter change when the current checksum value does not equal the saved checksum value.
4. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.
5. The capability to disable Bluetooth on control panels that include Bluetooth functionality shall be provided.

G. Network Communications
1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Optional communication cards for BACnet/IP, LonWorks, Profibus, Profinet, EtherNet/IP, Modbus TCP, and DeviceNet shall be available. The use of third party gateways are not acceptable.
2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card based protocol. Once installed, the drive shall automatically recognize any optional communication cards without the need for additional programming.
3. The drive shall not require a power cycle after communication parameters have been updated.
4. The embedded BACnet connection shall be a MS/TP interface. The drive shall be BTL Listed to Revision 14 or later. Use of non-BTL Listed drives are not acceptable.
5. The drive shall be classified as an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
   a. Data Sharing: Read Property Multiple-B, Write Property Multiple-B, COV-B
   b. Device Management: Time Synchronization-B
   c. Object Type Support: MSV, Loop
6. The drive’s relay output status, digital input status, analog input/output values, Hand-Auto status, warning and fault information shall be capable of being monitored over the network. The drive’s start/stop command, speed reference command, relay outputs and analog outputs shall be capable of being controlled over the network. Remote drive fault reset shall be possible.

H. Disconnect – A circuit breaker or disconnect switch shall be provided when indicated on the drive schedule. The disconnect shall be door interlocked and padlockable. Drive input fusing shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete

assembly and carry a UL508 label. Disconnect packages manufactured by anyone other than the drive manufacturer, are not acceptable.

I. Bypass – Bypass drive packages shall be provided when indicated on the drive schedule. All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Bypasses manufactured by anyone other than the drive manufacturer, are not acceptable.

1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.
2. The drive and bypass package shall have a UL listed short circuit current rating of 100 kA, for 240 VAC and 480 VAC systems, and this rating shall be indicated on the rating label.
3. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.
4. The drive and bypass package shall be seismic certified and labeled to the IBC. Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake table test data as defined by ICC AC-156. Seismic certification of equipment and components shall be provided by OSHPD preapproval.
5. All bypass packages shall utilize a dedicated LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel. Bypass packages that use a single shared drive/bypass control panel are not acceptable, due to that control panel acting as a single point of failure.
    a. The bypass shall include a two-line, 20-character LCD display. The display shall allow the user to access parameters and view:
        1) Bypass input voltage, current (Amps) and power (kW)
        2) Bypass faults, warnings, and fault logs
        3) Bypass operating time and energy consumption (resettable)
    b. The bypass control panel shall include the following controls:
        1) Four navigation keys (Up, Down, Enter, Escape)
        2) Bypass Hand-Off-Auto, Drive mode / Bypass mode selectors, Bypass fault reset
    c. The following indicating lights (LED PTT type) or control panel display indications shall be provided.
        1) Drive mode selected, Bypass mode selected
        2) Drive running, Bypass running
        3) Drive fault, Bypass fault
    d. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.
6. All bypasses shall have the following hardware features/characteristics as standard:
    a. Six (6) digital inputs and five (5) Form-C relay outputs. The digital inputs shall be capable of accepting both 24 VDC and 24 VAC. The bypass control board shall include an auxiliary power supply rated 24 VDC, 250 mA.
    b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable. Third contactor “isolation contactors” and

service switches are not an acceptable alternative to drive isolation fuses.

c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.

d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive's control board has failed. Network communications shall remain functional. Bypass systems that do not maintain full functionality in the event of a drive failure, are not acceptable.

7. All bypasses shall have the following software features as standard:

a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.

b. The bypass shall also support run permissive and start interlock control functionality, including start delay, as previously specified in the drive section.

c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.

d. The bypass shall include a selection for either manual or automatic transfer to bypass. The automatic transfer mode shall allow the user to select the specific drive fault types that result in an automatic transfer to bypass. The automatic transfer mode shall not allow a transfer to bypass on motor related faults. Automatic transfer schemes that do not differentiate between fault types, are not acceptable.

e. The bypass shall include the ability to select the operating mode of the system (Drive/Bypass) from either the bypass control panel or digital input.

f. The bypass shall include a supervisory control mode that monitors the value of the drive's analog input (feedback). This feedback value is used to control the bypass contactor on/off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps.

g. Selectable Class 10, 20, or 30 electronic motor overload protection shall be included in both drive and bypass mode.

h. The drive and bypass shall be designed to operate as an integrated system when in Override mode. Whether operating in drive or bypass mode, the low priority safeties will be ignored, and high priority safeties will be followed. External start/stop commands will be ignored. There shall be four selectable Override modes:

1) Bypass only, with two smoke control modes:

a) Fixed pre-configuration of digital inputs

b) Configurable high/low priority safeties and faults, to allow configuration to meet needs of local Authority Having Jurisdiction.

2) Drive only

3) Drive then transfer to bypass, in the event of a drive fault

4) Force to Stop

8. Network communications – the bypass shall include BACnet MS/TP, Modbus, and Johnson Controls N2 as standard. The bypass BACnet implementation shall be BTL Listed to Revision 14 or later. Optional communication cards for

BACnet/IP, LonWorks, Profibus, Profinet, Ethernet/IP, Modbus TCP, and DeviceNet shall be available.

a. The bypass relay output status, digital input status, warning and fault information can be monitored over the network. Status information shall be monitored, including; operating mode (drive vs bypass), current drawn in bypass mode, broken belt, and phase-to-phase voltage. The bypass start/stop command, force to bypass command, and relay outputs shall be capable of being controlled over the network.

PART 3 EXECUTION

3.01 INSTALLATION

A. The responsible party shall install the drive in accordance with the recommendations of the drive manufacturer as outlined in the drive installation manual.

B. Power wiring shall be completed by the responsible party. All wiring shall be installed in accordance with the recommendations of the drive manufacturer as outlined in the installation manual.

C. Installation shall be in accordance with national, state and local building and electrical codes as may be in force in the installation area.

3.02 START-UP

A. Start-up shall be provided for each drive by an authorized local service provider.

3.03 PRODUCT SUPPORT

A. Factory trained application engineering and service personnel that are thoroughly familiar with the drive products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US and Canada shall be available.

B. Training shall include installation, programming and operation of the drive, bypass and network communications. Owner training shall be provided locally upon request.

3.04 WARRANTY

A. The drive Product Warranty shall be 60 months from the date of shipment from the factory. The warranty shall include: Parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer’s technical support. Provide factory authorized start-up service, and provide start-up report to A/E for review and approval.

END OF SECTION

SECTION 23 0516
EXPANSION COMPENSATION IN HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for expansion compensation in the Heating, Ventilating, and Air Conditioning System.

1.02 RELATED SECTIONS

A. Section 23 0548 – Vibration and Seismic controls for HVAC Piping and Equipment.

B. Section 23 0923 – DDC System for HVAC.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 3100 – HVAC Ducts and Casings.

E. Division 23 – All Sections.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of expansion compensation products of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Comply with standards of the Expansion Joint Manufacturer's Association (EJMA).

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of expansion compensation product. Submit schedule showing Manufacturer's figure number, size, location, and features for each required expansion compensation product.

B. Shop Drawings: Submit shop drawings for fabricated expansion loops indicating location, dimensions, pipe sizes, location and method of attachment of anchors.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of expansion compensation product. Include this data in Maintenance Manual.

PART 2 PRODUCTS

2.01 PIPE ALIGNMENT GUIDES

A. General: Provide pipe alignment guides on both sides of expansion joints, and elsewhere as indicated. Construct with 4 finger spider traveling inside a guiding sleeve, with provision for anchoring to building substrate.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers

offering pipe alignment guides which may be incorporated in the work include, but are not limited to, the following:
Keflex, Inc.
Metraflex (The) Co.

PART 3 EXECUTION

3.01 EXPANSION LOOPS

A. General: Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.

END OF SECTION

SECTION 23 0519
METERS AND GAUGES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extent of meters and gauges required by this section is indicated on drawings and/or specified in other Division-23 sections.

B. Types of meters and gauges specified in this section include the following:
1. Temperature Gauges and Fittings:
   Glass Thermometers.
   Dial Type Insertion Thermometers.
   Thermometer Wells.
   Temperature Gauge Connector Plugs.
2. Pressure Gauges and Fittings:
   Pressure Gauges.
   Pressure Gauge Cocks.
   Pressure Gauge Connector Plugs.
3. Flow Meters:
   Hot/Chilled Water.

C. Meters and gauges furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division-23 sections.

1.02 RELATED SECTIONS

A. Section 23 2113 – Hydronic Piping.

B. Section 23 3100 – HVAC Ducts and Casings.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of meters, gauges, and fittings, or types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. UL Compliance: Comply with applicable UL standards pertaining to meters and gauges.

C. ANSI and ISA Compliances: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of meter, gauge and fitting. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter, gauge and fitting schedule shown manufacturer's figure number, scale range, location, and accessories for each meter, gauge and fitting.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter

and gauge. Include this data in maintenance manual.

PART 2 PRODUCTS

2.01 TEMPERATURE GAGES

A. Glass Thermometers:
1. General: Provide glass thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
2. Case: Die cast aluminum, finished in baked epoxy enamel, clear acrylic plastic front, spring secure, 9 inches long.
3. Adjustable Joint: Die cast aluminum, finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
4. Tube and Capillary: Mercury filled, magnifying lens, 1 percent scale range accuracy, shock mounted.
5. Scale: Satin faced, non-reflective aluminum permanently etched markings.
6. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.
7. Range: Conform to the following:
   a. Hot Water: 30 degrees - 240 degrees F with 2-degree F scale divisions (0 degrees - 160 degrees Celsius) with 1-degree Celsius scale divisions.
   b. Chilled Water: 30 degrees - 180 degrees F with 2 degrees F scale divisions (0 degrees-100 degrees Celsius) with 1-degree Celsius scale divisions.
8. Available Manufacturers: Subject to compliance with requirements, manufacturers offering glass thermometers which may be incorporated in the work include, but are not limited to, the following:
   Marshalltown Instruments, an Eltra Co.
   Trerice (H.O.) Co.
   Weiss (Albert A) & Son, Inc.

B. Dial Type Insertion Thermometers:
1. General: Provide diam type insertion thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
2. Type: Bi-metal, stainless steel case and stem, 1 inch diameter dial, dust and leak proof, 1/8-inch diameter stem with nominal length of 5 inches.
3. Accuracy: 0.5 percent of dial range.
4. Range: Conform to the following:
   a. Hot Water: 0 degrees - 220 degrees F (-10 degrees - 110 degrees C).
5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering direct mount dial type insertion thermometers which may be incorporated in the work include, but are not limited to, the following:
   Marsh Instrument Co, Unit of General Signal.
   Taylor Instrument Process Control Div. of Sybron Corp.
   Trerice (H.O.) Co.
   Weiss (Albert A.) & Son, Inc.

C. Thermometer Separable Wells:
1. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2-inch extension for insulated piping.

2. Available Manufacturers: Subject to compliance with requirements,

manufacturers offering thermometer wells which may be incorporated in the work include, but are not limited to the following:
Marsh Instrument Co., Unit of General Signal.
Trerice (H.O.) Co.
Weiss (Albert A.) & Sons, Inc.

D. Temperature Gage Connector Plugs:
1. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200 degrees F. Construct of brass and finish in nickel-plate, equip with 1/2-inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8-inch O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering temperature gage connector plugs which may be incorporated in the work include, but are not limited to, the following:
Peterson Engineering Co.

2.02 PRESSURE GAGES AND FITTINGS

A. Pressure Gages:
1. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
2. Type: General use, 1 percent accuracy, ANSI B40.1, Grade A, phosphor bronze bourbon type, bottom connection.
3. Case: Drawn steel or brass, clear acrylic plastic lends, 4-1/2-inch diameter.
4. Connector: Brass with 1/4-inch male NPT. Provide protective syphon when used for steam service.
5. Scale: White coated aluminum with permanent etched markings.
6. Range: Conform to the following:
a. Water: 0 - 100 psi.
7. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauges which may be incorporated in the work include, but are not limited to, the following:
Ametek, U.S. Gauge Div.
Marsh Instrument Co., Unit of General Signal.
Marshalltown, an Eltra Company
Trerice (H.O.) Co.
Weiss (Albert A.) & Son, Inc.

B. Pressure Gage Cocks:
1. General: Provide pressure gauge cocks between pressure gages and gauge tees on piping systems. Construct gage cock of brass with 1/4-inch female NPT on each end, and "T" handle brass plug.
2. Syphon: 1/4-inch straight coil constructed of brass tubing with 1/2-inch male NPT on each end.
3. Snubber: 1/4-inch brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
4. Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gage cocks which may be incorporated in the work include, but are not limited to, the following:
Ametek, U.S. Gauge Div.

Marsh Instrument Co., Unit of General Signal.
Marshalltown, An Eltra Company
Trerice (H.O.) Co.
Weiss (Albert A.) & Son, Inc

C. Pressure Gage Connector Plugs:
1. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200 degrees Fahrenheit. Construct of brass and finish in nickel-plate, equip with 1/2-inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8-inch O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauge connector plugs which may be incorporated in the work include, but are not limited to, the following:
Peterson Engineering Co.

2.03 HOT/CHILLED WATER FLOW METERS

A. The flow meter shall be a retractable insertion, vortex shedding type meter. The flowmeter's wetted measuring element shall have no moving parts. The flow meter shall be installed or removed under full flow conditions. The flow meter shall be installed with 2-inch NPT treadolet. A piezo-resistive sensor shall be used to detect vortex signals.

B. Each flow meter shall be individually factory wet flow calibrated. Combined linearity and repeatability shall be plus or minus 1 percent of full scale. The flow meter shall be available for line sizes from 4 to 20 inches. Metering range shall be from 0.3 to 15 ft/sec. The operating temperature range shall be from 32 degrees to 250 degrees F. The flow meter shall operate under a maximum process pressure of 150 psi. The flow meter's retractor shall be constructed of aluminum and the ball valve shall be constructed of bronze. The ball valve shall have 2-inch NPTF connections. The sensor shall be constructed of materials suitable for application and the shredder bar construction shall be 316 stainless-steel.

C. Electronics shall be hermetically sealed. The flow meter shall have a 4-20 mA current output.

D. The flow meter shall have a 2-year warranty. The flow meter shall be equal to Spirax Sarco VIM20-V-S-L-D-DL-1HL-S-PO-PNPTR, as described above.

PART 3 EXECUTION

3.01 INSTALLATION OF TEMPERATURE GAGES

A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.

B. Thermometer Separable Wells: Install in piping for each temperature gage.

C. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.02 INSTALLATION OF PRESSURE GAGES

A. General: Install pressure gages in piping with pressure gage cock, located on pipe at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated:
   1. At suction and discharge of each hydronic pump or as a common gauge, if so detailed on drawings.
   2. At each pressure reducing valve on both the high pressure and low-pressure sides.
   3. At water service outlet.

C. Pressure Gage Cocks: Install in piping tee with snubber.

D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

END OF SECTION

SECTION 23 05 23
VALVES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 23 Basic Materials and Methods section, and is a part of each Division 23 section making reference to valves specified herein.

1.02 DESCRIPTION OF WORK

A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 23 sections.

B. Types of valves specified in this section include the following:
Gate Valves
Globe Valves
Drain Valves
Ball Valves
Check Valves
Swing Check
Wafer Check
Lift Check
Butterfly Valves

C. Valves furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 23 sections.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of domestic valves, of types and sizes required. All valves shall be manufactured in the United States of America.

B. Marking of Valves: Comply with MSS SP-25.

C. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding end, valve bodies, comply with ANSI B16.10.

D. Valves Installed in Boiler Rooms: Comply with ASME Boiler and Pressure Vessel Code.

E. Valve Types: Provide valves of same type by same manufacturer.

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing Manufacturer's figure number, size, location, and valve features for each required valve.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data in Maintenance Manual.

PART 2 PRODUCTS

2.01 VALVES

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated; connections which properly mate with pipe, tube, and equipment connections and where more than one type is indicated, selection is Installer's option.

2.02 GATE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Comply with the following standards.
1. Cast-Iron Valves: MSS SP-70.
2. Bronze Valves: MSS SP-80.
3. Steel Valves: ANSI B16.34.

C. For Domestic Water Service:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, Milwaukee 1151.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge, Milwaukee F-2885M.

D. For HVAC Hot, Chilled and Condenser Water Service:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, Milwaukee 1151.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge, Milwaukee F-2886M.

E. For Low Pressure Steam Services:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, Milwaukee 1151.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, rising stem. OS&Y, solid wedge, Milwaukee F-2885.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following:
Milwaukee Valve Company.
Powell (Wm.) Co.
Stockham Valves and Fittings, Inc.

2.03 GLOBE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal seated globe

valves, provide hardened stainless-steel disc and seat ring.

C. Comply with the following standard:
1. Cast-Iron Valves: MSS SP-85.
2. Bronze Valves: MSS SP-80.
3. Steel Valves: ANSI B16.34.

D. For Domestic Water Service:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, composition disc, Milwaukee 590T.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body, bronze trimmed, bolted bonnet, rising stem, OS&Y, renewable seat and disc, Milwaukee F2981.

E. For HVAC Hot and Chilled Water Service:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, composition disc.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body, bolted bonnet, rising stem, OS&Y, renewable seat and disc.

F. For Low Pressure Steam Services:
1. Threaded Ends 2 Inches and Smaller: Class 150, bronze body, union bonnet, rising stem, composition disc, Milwaukee 590T.
2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body, bronze trimmed, bolted bonnet, rising stem, OS&Y, renewable seat and disc, Milwaukee F2981.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:
Milwaukee Valve Company.
Powell (Wm.) Co.
Stockham Valves and Fittings, Inc.

2.04 DRAIN VALVES

A. For Low Pressure Drainage Service:
1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4-inch hose outlet connection, Milwaukee 1152M.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:
Milwaukee Valve Company.
Powell (Wm.) Co.
Stockham Valves and Fittings, Inc.

2.05 BALL VALVES

A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

B. Comply with the following standards:
1. Steel Valves: ANSI B16.34.

C. For Domestic Water Service:
1. Threaded Ends 2 Inches and Smaller: Class 125, bronze 2-piece body, bronze ball, bronze stem, Milwaukee BA-500.

D. For HVAC Hot, Chilled and Condenser Water Service:
   1. Threaded Ends 2 Inches and Smaller: Class 125, bronze 2-piece body, bronze ball, bronze stem, Milwaukee BA-300.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball valves which may be incorporated in the work include, but are not limited to the, the following:
Milwaukee Valve Company.
Powell (Wm.) Co.
Stockham Valves and Fittings, Inc.

2.06 SWING CHECK VALVES

A. General: Construct pressure containing parts of valves as follows:
   1. Bronze Valves, 125 or 150 psi: ANSI/ASTM B62.
   2. Metallic Seated Bronze Valves, 200 or 300 psi: ANSI/ASTM B61.
   3. Iron Body Valves: ANSI/ASTM A126, Grade B.

B. Comply with MSS SP-71 for design, workmanship, material and testing.

C. Construct valves of pressure castings free of any impregnating materials.

D. Construct valves of bronze, regrinding, with seating angle 40 °F to 45 °F, unless composition disc is specified.

E. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

F. Construct disc and hanger as separate parts, with disc free to rotate.

G. Support hanger pins on both ends by removable side plugs.

H. For Domestic Water Service:
   1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc, Milwaukee 509.
   2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, Milwaukee 297A.

I. For HVAC Hot, Chilled and Condenser Water Service:
   1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed cap, horizontal switch, bronze disc, Milwaukee 509.
   2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, Milwaukee 2974.

J. For Low Pressure Steam Service:
   1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc, Milwaukee 509.
   2. Flanged Ends 2-1/2 Inches and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, Milwaukee 2974.

K. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to, the following:
Milwaukee Valve Company
Powell Co (The Wm.)
Stockham Valves and Fittings, Inc

2.07 BUTTERFLY VALVES

A. Butterfly valves in chilled water and condenser water supply and return piping, where shown on plans, shall be Demco Series NE, Milwaukee "M" Series, or approved equal. Ductile iron lug type body drilled and tapped for cap screws. Aluminum bronze disc; 416 stainless steel stems; Buna-N stem seals; Buna-N seat, field renewable type. Neck to provide handles or actuator clearance over 2 inches thick line insulation. Furnish set of ASA 150 Weld-Neck flanges and caps-crews for each valve. Valves on pumped systems shall have operator with wheel handle. Chain operators shall be provided on all vales in Mechanical Rooms mounted 7'-0" or higher above floor level.

2.08 VALVE FEATURES

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

B. Bypass: Comply with MSS SP-45, and except as otherwise indicated provide manufacturer's standard bypass piping and valving.

C. Drain: Comply with MSS SP-45, and provide threaded pipe plug complying with Division-15 "Pipe, Tube, and Fittings" section.

D. Flanged: Valve flanges complying with ANSi B16.5 (steel) or ANSI B16.24 (bronze).

E. Threaded: Valve ends complying with ANSI B2.1.

F. Butt-Welding: Valve ends complying with ANSI B16.25.

G. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

H. Wafer: Flangeless valves.

I. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.

J. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.

K. Renewable Seat: Design seat of valve with removable disc, and assembly valve so disc can be replaced when worn.

L. Extended Stem: Increase stem length by 2 inches minimum, to accommodate insulation applied over valve.

M. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve.

N. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union, or welding.

O. Solid Wedge: One-piece tapered disc in gate valve, designed for contact on both sides.

P. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as

valve is operated from closed to open position.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements.
   1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
   2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

E. Mechanical Actuators: Install mechanical actuator with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler rooms; and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.

F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections.
   1. Pipe Size 2 Inches and Smaller: One of the following, at Installer's option:
      Threaded valves
      Grooved-end valves (Fire Protection Only).
      Flanged valves
   2. Pipe Size 2-1/2 Inches and Larger: One of the following, at Installer's option:
      Grooved-end valves (Fire Protection Only).
      Flanged valves

G. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

H. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

I. Renewable Seats: Select and install valves with renewable seats except where otherwise indicated.

J. Fluid Control: Except as otherwise indicated, install, gate, ball, globe and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valve.

K. Installation of Check Valves:

1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
2. Horizontal Life Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete: Equipment bases.

B. Section 23 07 19 – HVAC Piping Insulation.

C. Section 23 21 13 - Hydronic Piping.

D. Division 23 – All Sections.

1.03 REFERENCES

A. ASME B31.2 - Fuel Gas Piping

B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

1.04 SUBMITTALS

A. Submit under provisions of Section 23 05 00 and Section 01 33 23.

B. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Water:
   1. Conform to ASME B31.9 and ASTM F708.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   6. Wall Support for Pipe: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   10. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Hydronic Piping:
   1. Conform to ASME B31.9 and ASTM F708.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   6. Vertical Support: Steel riser clamp.
   7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.03 FLASHING

A. Metal Flashing: 28 gage 304 stainless steel.

B. Copper Flashing: 16 oz./sq. ft.

C. Lead Flashing:
   1. Waterproofing: 6 lb/sq ft.

D. Caps: Steel, 22 gauge minimum; 16 guage at fire resistant elements.

2.04 SLEEVES

A. Sleeves for Pipes Thru Non-fire Rated Floors: 18 gauge galvanized steel.

B. Sleeves for Pipes Thru Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe.

C Sleeves for Ductwork and Pipes Thru Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Galvanized steel.

E. Sleeves for Rectangular Ductwork: Galvanized steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing

between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, where indicated on Drawings, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00. Coordinate exact size requirement for pads.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork

penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 4 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counterflash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.

D. Where piping or ductwork penetrates fire or smoke rated floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Secure collar or escutcheon to prevent blow-out. Fire stopping materials shall meet requirements of ASTM E119.

E. Install chrome plated steel escutcheons at finished surfaces.

3.06 SCHEDULES

HANGER ROD

PIPE SIZE	MAX. HANGER SPACING	DIAMETER
Inches	Feet	Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8

END OF SECTION

SECTION 23 0548
VIBRATION AND SEISMIC CONTROL FOR HVAC SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Includes furnishing and installing vibration and seismic components for HVAC piping, ductwork and equipment

1.02 RELATED SECTIONS

A. Painting - Section 09 9000.

B. Hydronic Piping – Section 23 2113.

C. Common Work Results for HVAC – Section 23 0500.

D. Division 23 – All Sections.

1.03 SUBMITTALS

A. See Section 01 3323 – Submittals, for Submittals Procedures.

B. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
   1. Descriptive Data:
      a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
      b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
   2. Shop Drawings:
      a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
      b. Provide all details of suspension and support for ceiling suspended equipment.
      c. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
      d. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
   3. Seismic Certification and Analysis:
      a. Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
      b. All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing

are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode.

c. Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in section 1.06 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

C. Typical Applicable Codes and Standards

1. The seismic protection shall be provided as required by chapter 16 of the Arkansas Fire Code (International Building Code) Volume II. This building shall meet design classification “C” requirements.

1.04 QUALITY ASSURANCE

A. The vibration and seismic control system shall be designed and fabricated by a firm which is regularly engaged, for a minimum of five years, in designing of piping systems similar to that required for this project.

B. All system designers, supervisors and installers shall have five (5) years experience.

1. Prior to installation, submit data showing that Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
2. Qualifications of System Technician: Installation drawings, shop drawings and as-built drawings shall be prepared, by or under the supervision of an individual who is experienced with the types of works specified herein.

C. The entire installation shall be guaranteed for a period of one (1) year from the building acceptance date.

1.05 SEISMIC FORCE LEVELS

A. The following force levels will be used on this project.
MINIMUM F_p (G’s) FORCES EQUAL TO OR EXCEEDING BUILDING CODE LIST IN 1.03.

IBC-2000 TI-809-04	IBC-2003 NFPA-5000	“G” Forces for High Deformability Pipe, Bus Ducts, Conduits &	“G” Forces for Rigidly Mounted Equipment & Limited Deformability	“G” Forces for Vibration Isolated Equipment & Pipe Pressure Vessels	“G” Forces for Low Deformability Pipe

		Cabletrays a_p*=1.0, R_p*=3.5		Pipe a_p*=1.0, R_p*=2.5		a_p*=2.5, R_p*=2.5		a_p*=1.0, R_p*=1.25	
Ss = 0.616		Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.
Lower Levels and Ground Level		0.22	0.15	0.22	0.15	0.29	0.15	0.23	0.15
Above Ground Level up to 1/4 of the Height of the Building		0.22	0.15	0.22	0.15	0.44	0.15	0.35	0.15
Above 1/4 up to 1/2 of the Height of the Building		0.22	0.15	0.23	0.15	0.58	0.15	0.47	0.15
Above 1/2 up to 3/4 of the Height of the Building		0.22	0.15	0.29	0.15	0.73	0.15	0.58	0.15
Above 3/4 of the Height of the Building up to the Roof		0.25	0.15	0.35	0.15	0.88	0.15	0.7	0.15

PART 2 PRODUCTS

2.01 INTENT

A. All vibration isolators and seismic restraints described in this section shall be the product of a single manufacturer. Mason Industries' products are the basis of these specifications; products of other manufacturers are acceptable provided their systems strictly comply with the specification and have the approval of the specifying engineer. Submittals and certification sheets shall be in accordance with section 1.03.

B. For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8" (3mm) and/or horizontal permanent deformation greater that 1/4" (6mm).

2.02 PRODUCT DESCRIPTIONS

A. Vibration Isolators and Seismic Restraints.

SPECIFICATION:

1. Two layers of 3/4" (19mm) thick neoprene pad consisting of 2" (50mm) square waffle modules separated horizontally by a 16 (1.5mm) gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be type Super W as manufactured by Mason Industries, Inc.
2. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" (5mm) and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Preapproval "R"Number from

OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be type BR as manufactured by Mason Industries, Inc.

3. Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality. Bushing assemblies shall be type PB as manufactured by Mason Industries, Inc.
4. A one-piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal-to-metal contact. Neoprene bushings shall be type HG as manufactured by Mason Industries, Inc.
5. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" (6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type SLF as manufactured by Mason Industries, Inc.
6. Restrained spring mountings shall have an SLF mounting as described in Specification 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Restraining Bolts shall have a neoprene bushing between the bolt and the housing. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall have Anchorage Preapproval “R” Number from OSHPD in the state of California certifying the maximum certified horizontal and vertical load ratings. Mountings shall be type SLR or SLRS as manufactured by Mason Industries, Inc.
7. Spring mountings as in specification 5 built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4" (6mm) travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Preapproval “R” number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be type SSLFH as manufactured by Mason Industries, Inc.
8. Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus

1/8" (3mm). Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician. Air Springs shall be type MT and leveling valves type LV as manufactured by Mason Industries, Inc.

9. Restrained air spring mountings shall have an MT air spring as described in Specification 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces. Mountings shall be type SLR-MT as manufactured by Mason Industries, Inc.
10. Hangers shall consist of rigid steel frames containing minimum 1 1/4" (32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification 5 seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30deg. arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30-deg. capability. Hangers shall be type 30N as manufactured by Mason Industries, Inc.
11. Hangers shall be as described in 10, but they shall be supplied with a combination rubber and steel rebound washer as the seismic upstop for suspended piping, ductwork, equipment and electrical cable trays. Rubber thickness shall be a minimum of 1/4" (6mm). Submittals shall include a drawing of the hanger showing the installation of the rebound washer. Hangers shall be type RW30N as manufactured by Mason Industries, Inc.
12. Hangers shall be as described in 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30-deg. capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc.
13. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cables must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an Anchorage Preapproval “R” Number from OSHPD in the State of California verifying the maximum certified load ratings. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod nut and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
14. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper

attachment. Seismic solid brace assembly shall have anchorage preapproval “R” number from OSHPD in the state of California verifying the maximum certified load ratings. Solid seismic brace assemblies shall be type SSB, SSBS or SSRF as manufactured by Mason Industries, Inc.

Note: Specifications 12 - 14 apply to trapeze as well as clevis hanger locations. At trapeze anchor locations piping must be shackled to the trapeze. Specifications apply to hanging equipment as well.

15. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Preapproval “R” Number from OSHPD in the State of California. Rod clamp assemblies shall be type SRC or UC as manufactured by Mason Industries, Inc.
16. Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an Anchorage Preapproval “R” Number from OSHPD in the State of California. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.
17. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4" (6mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm^2). A minimum air gap of 1/8" (3mm) shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to ensure no short circuits exist before systems are activated. Snubbers shall have an Anchorage Preapproval “R” Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Snubber shall be type Z-1225 as manufactured by Mason Industries, Inc.

    All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall be replaceable and a minimum of 3/4" (19mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm^2). Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" (3mm) nor more that 1/4"(6mm). Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8" (9mm) deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable” G” force. Submittals shall include the load deflection curves up to 1/2" (12mm) deflection in the x, y and z planes. Snubbers shall have an anchorage preapproval “R” number from OSHPD in the state of California verifying the maximum certified horizontal and vertical load ratings. Snubbers shall be type Z-1011 as manufactured by Mason Industries, Inc.
18. Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is “rolled up” to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads. Drill-in stud wedge anchors shall be type SAS as manufactured by Mason Industries, Inc.
19. Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an

evaluation report number from the I.C.B.O. Evaluation Service, Inc. verifying to its allowable loads. Drill-in female wedge anchors shall be type SAB as manufactured by Mason Industries, Inc.

20. Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" (350mm) provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1" (25mm). Bases shall be type WF as manufactured by Mason Industries, Inc.

21. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6" (150mm). The base depth need not exceed 12" (300mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" (12mm) bars welded in place on 6" (150mm) centers running both ways in a layer 1½" (38mm) above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1" (25mm) clearance below the base. Wooden formed bases leaving a concrete rather then a steel finish are not acceptable. Base shall be type BMK or K as manufactured by Mason Industries, Inc.

22. Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Kevlar® tire cord frictioning. Any substitutions must have equal or superior physical and chemical characteristics. Solid steel rings shall be used within the raised face rubber flanged ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2" (50mm) and larger shall have two spheres reinforced with a ductile iron external ring between spheres. Flanges shall be split ductile iron or steel with hooked or similar interlocks. Sizes 16"(400mm) to 24" (600mm) may be single sphere. Sizes ¾" (19mm) to 1½" (38mm) may have threaded two-piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psi up to 170deg.F with a uniform drop in allowable pressure to 215 psi at 250deg F° in sizes through 14" (350mm). 16" (400mm) through 24" (600mm) single sphere minimum ratings are 180 psi at 170deg F and 150 psi at 250deg. F. Higher rated connectors may be used to accommodate service conditions. All expansion joints must be factory tested to 150% of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3/1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints. Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. If control rods are used, they must have ½" (12mm) thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psi (.7 kg/mm^2) maximum on the washer area. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All

expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be type SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as manufactured by Mason Industries, Inc.

23. Flexible stainless-steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" (75mm) and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

Flanged

3" x 14" (75 x 350mm)	6" x 20" (150 x 500mm)	12" x 28" (300 x 700mm)
4" x 15" (100 x 375mm)	8" x 22" (200 x 550mm)	14" x 30" (350 x 750mm)
5" x 19" (125 x 475mm)	10" x 26" (250 x 650mm)	16" x 32" (400 x 800mm)

Male Nipples

1/2" x 9" (12 x 225mm)	1 1/4" x 12" (32 x 300mm)	2" x 14" (50 x 350mm)
3/4" x 10" (19 x 250mm)	1 1/2" x 13" (38 x 325mm)	2 1/2" x 18" (64 x 450mm)
1" x 11" (25 x 275mm)		

Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

24. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" (12mm) thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi (.35 kg/mm^2) and the design shall be balanced for equal resistance in any direction. All-directional anchors shall be type ADA as manufactured by Mason Industries, Inc.

25. Split Wall Seals consist of two bolted pipe halves with minimum 3/4" (19mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" (25mm) past either face of the wall. Where temperatures exceed 240deg. F, 10# (4.5kg) density fiberglass may be used in lieu of the sponge. Seals shall be type SWS as manufactured by Mason Industries, Inc.

26. The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in specification 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" (6mm) movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the ductwork or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit. Horizontal thrust restraints shall be type WBI/WBD as manufactured by Mason Industries, Inc.

27. Housekeeping pad anchors shall consist of a ductile iron casting that is tapered and hexagonal, smaller at its base than at its top. The upper portion shall have holes for rebar to pass through. The anchor shall be continuously threaded from top to bottom for the attachment of soleplates. Housekeeping pad anchors shall be attached to the structural slab using a stud wedge anchor. Housekeeping pad anchors shall be type HPA and stud wedge anchor shall be type SAS both as manufactured by Mason Industries, Inc.

PART 3 EXECUTION

3.01 GENERAL

A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. The contractor shall not install any equipment or piping, which makes rigid connections with the building unless isolation is not specified. “Building” includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors expense.

G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors expense.

H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractors expense.

I. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:
   1. Flanges of structural beams.
   2. Upper truss cords in bar joist construction.
   3. Cast in place inserts or wedge type drill-in concrete anchors.

J. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

K. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

L. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 4 braces.

M. At locations where specification 12 cable restraints are installed on support rods with spring isolators, the spring isolation hangers must be specification type 1.

N. At all locations where specification 12 or 13 restraints are attached to pipe clevis, the clevis cross bolt must be reinforced with specification type 5 braces.

O. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 9 female wedge type for floor mounted equipment.

P. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.

Q. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24” or specified movements exceed specification 23 capabilities.

R. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 12 wall seals.

S. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28 (see selection guide).

T. Locate isolation hangers as near to the overhead support structure as possible.

U. All mechanical equipment shall be vibration isolated and seismically restrained as per the schedules in Part 4 of this specification.

3.02 VIBRATION ISOLATION OF PIPING

A. Horizontal pipe isolation: The first four pipe hangers in the main lines near the mechanical equipment shall be as described in specification 11. Brace hanger rods with SRC clamps specification 14. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in specification 10 & 10A. Floor supported piping shall rest on isolators as described in specification 6. Heat exchangers and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" (19mm) deflection for pipe sizes up to and including 3" (75mm), 1 1/2" (38mm) deflection for pipe sizes up to and including 6" (150mm), and 2 1/2" (64mm) deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Hanger locations that also have seismic restraints attached must have type RW Rebound Washers to limit uplift. Where piping connects to mechanical equipment install specification 23 expansion joints or specification 24 stainless hoses if 23 is not suitable for the service.

B. Riser isolation: Risers shall be suspended from specification 10A hangers or supported by specification 5 mountings, anchored with specification 10 anchors, and guided with specification 11 sliding guides. Steel springs shall be a minimum of 0.75" (19mm) except in those expansion locations where additional deflection is required to limit load changes to +/- 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

C. Seismic Restraint of Piping
1. Seismically restrain all piping listed as a, b or c below. Use specification 2 cables if isolated. Specification 2 or 3 restraints may be used on un-isolated piping.
   a. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.
   b. All other piping 2 1/2" (64mm) diameter and larger.
2. Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
3. Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
5. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" (600m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.
6. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
7. Branch lines may not be used to restrain main lines.
8. Connection to the structure must be made with a non-friction connection (i.e. no “C” clamps)
9. Hanger locations that also have seismic restraints attached must have Specification 10A type RW Rebound Washers.

D. Pipe Exclusions
1. Gas piping less than 1" (25mm) inside diameter.
2. Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.
3. All other piping less than 2 1/2" (64mm) inside diameter.
4. a. All piping suspended by clevis hangers where the distance from the top of the pipe to the suspension point is 12” or less.
   b. All trapezed piping where the distance from the suspension point to the trapeze member is 12" or less.
   c. If any suspension location in the run exceeds the above, the entire run must be braced.

3.03 VIBRATION ISOLATION AND SEISMIC RESTRAINT OF DUCTWORK

A. Vibration isolation of ductwork
1. All discharge runs for a distance of 50' (15m) from the connected equipment shall be isolated from the building structure by means of specification 10 hangers or specification 5 floor isolators. Spring deflection shall be a minimum of 0.75" (19mm).
2. All duct runs having air velocity of 1000 fpm (5 m/s)or more shall be isolated from the building structure by specification 11 hangers or 5 floor supports. Spring deflection shall be a minimum of 0.75" (19mm).

B. Seismic restraint of ductwork
1. Seismically restrain all ductwork with specification 12 or 13 restraints as listed below:
   a. Restrain rectangular ducts with cross sectional area of 6 sq.ft. (.5 m^2) or larger.

b. Restrain round ducts with diameters of 28" (700mm) or larger.
c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.

2. Transverse restraints shall occur at 30' (9mm) intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
3. Longitudinal restraints shall occur at 60' (18m) intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
4. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
6. Walls, including gypsum board non bearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.
7. Connection to the structure must be made with a non-friction connection (i.e. no “C” clamps)
8. Hanger locations that also have seismic restraints attached must have Specification 10A type RW Rebound Washers.

C. Ductwork Exclusions

1. Rectangular and square and ducts that are less than 6 square feet in cross sectional area.
2. Oval ducts that are less than 6 square feet (.5m^2) in cross sectional area based on nominal size.
3. Round duct less than 28" (.5m^2) in diameter.
4. a. All trapezed ductwork where the distance from the suspension point to the trapeze member is 12" or less.
   b. Ductwork hung with straps where the top of the duct is 12" or less from the suspension point and the strap has 2 #10 sheet metal screws within 2" of the top of the duct.
   c. If any suspension location in the run exceeds the above, the entire run must be braced.

PART 4 SCHEDULES

4.01 EQUIPMENT ISOLATOR AND SEISMIC RESTRAINT SCHEDULE

	Vibration Isolation and/or Seismic Restraint	
Equipment Schedule	Specification	Static Deflection
Air Terminals	12, 14	None
Air Handling Units – Floor Mounted	4,19	By Manufacturer
Air Handling Units- Roof Mounted	22A	By Manufacturer
Unit Heaters	12, 14	None
Fans – Roof Mounted	22A	None

Fans – Wall Mounted		None
Ductwork	12, 14	None
Piping	12, 14, 15	None
Water Heaters – (Domestic) Boilers	4, 19	None

*If static deflection isn't listed, then the product does not require resilient mounts, or spring hangers.

*Equipment listed above with no specification # listed will be provided with restraint calculations and installation details. Mounting hardware will be by others.

4.02 EXCLUSIONS:

A. VAV boxes, fan powered terminal equipment, and other equipment connected to the duct system shall be restrained if the equipment weighs more than 50 lbs. Equipment weighing more than 20 lbs., and is connected flexibly to the ductwork, shall be seismically restrained. Any equipment weighing less than 20 lbs. is exempt.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-23 sections.

B. Type of identification devices specified in this section include the following:
Plastic Pipe Markers.
Valve Tags.
Valve Schedule Frames.
Engraved Plastic-Laminate Signs.
Ceiling Tacks.

C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of the equipment assembly in other Division-23 sections.

1.02 RELATED SECTIONS

A. Section 23 2113 – Hydronic Piping.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

1.04 SUBMITTALS

A. Product Data: Submit product specifications and installation instructions for each identification material and device desired.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.

PART 2 PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for

each application as referenced in other Division-21 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

B. Plastic Pipe Markers:
1. General: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
a. Small Pipes: For external diameters less than 6 inches (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
(1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
(2) Adhesive lap joint in pipe marker overlap.
b. Large Pipes: For external diameters of 6 inches and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
(1) Laminated or bonded application of pipe marker to pipe (or insulation)
(2) Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.
c. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
d. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
e. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Valve Tags:
1. At the Contractor's option, provide one of the following:
a. Brass Valve Tags: provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4-inch-high letters and sequenced valve numbers 1/2 inch high, and with 5/32-inch hole for fastener. Provide 1-1/2-inch diameter tags, except as otherwise indicated.
b. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32-inch-thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4-inch-high letters and sequenced valve numbers 1/2 inch high, and with 5/32-inch hole for fastener. Provide 1-1/2-inch square black tags with white lettering, except as otherwise indicated.
2. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

D. Valve Schedule Frames:
1. General: For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on walls. Provide frames of rigid plastic or metal, with plastic glazing.

E. Engraved Plastic-Laminate Signs:
1. General: Provide engraving stock melamine plastic laminate, complying with FS L-

P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

2. Thickness: 1/16 inch for units up to 20 square inches or 8-inch length; 1/8 inch for larger units.
3. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plastic pipe markers which may be incorporated in the work include, but are not limited to, the following:
Seton Name Plate Company
EMED Co., Inc.
Approved equal.

2.02 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/ maintenance of mechanical systems and equipment.

B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service.

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:
1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Ductwork Identification:
1. General: Identify air supply, return, exhaust, intake and relief ductwork with plastic signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).
2. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50' spacing along exposed areas.
3. Access Doors: Provide plastic-laminate type signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
4. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.

C. Piping System Identification:
   1. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, (shafts, tunnels, plenums), exterior non-concealed locations and above removable acoustical ceilings.
      a. Near each valve and control device.
      b. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
      c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
      d. At access doors, manholes and similar access points which permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced intermittently at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
      g. On piping above removable acoustical ceilings.

D. Valve Identification:
   1. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
   2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
      a. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than signet machine room.

E. Mechanical Equipment Identification:
   1. General: Install engraved plastic laminate sin on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
      a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
      b. Pumps and similar motor-driven units.
      c. Fans, blowers, primary balancing dampers and mixing boxes.
      d. Central-station units.
      e. Tanks and pressure vessels.
      f. Motor starters and other control equipment.

F. Refer to Division-15 sections for identification requirements at central-station mechanical control center; not work of this section.

G. Refer to Division-16 sections for identification requirements of electrical work; not work of this section.

H. Lettering Size: Minimum 3/8-inch-high lettering for name of unity where viewing distance is less than 2'-0"; 3/4 inch high for distances up to 6'-0"; and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 the size of principal lettering.

I. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, and warn of hazards and improper operations.

J. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

END OF SECTION

SECTION 23 05 66
UVC EMITTER ULTRAVIOLET DISINFECTION FOR IAQ: HVAC MOLD, BACTERIA & ODOR CONTROL

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED IN OTHER SECTIONS:

A. Motor starters, disconnects, power wiring of HVAC equipment, variable frequency drives and UVC Emitters: Division 26.

1.02 QUALITY ASSURANCE:

A. UL Compliance: Comply with UL Standard 1995 as applicable to usage of UVC Emitters in HVAC Equipment.

B. ISO Certification: Fixtures must be manufactured in an ISO 9001:2000 registered facility.

1.03 DELIVERY, STORAGE AND HANDLING:

A. Store UVC Emitters in a clean dry place and protect from weather and construction traffic. Handle UVC Emitters carefully to avoid damage to components, enclosures and finish. Leave factory-shipping covers in place until installation and only when called for in the installation instructions. Do not install damaged components; replace and return damaged components to equipment manufacturer.

B. Comply with manufacturer's installation instructions placement, wiring and testing.

PART 2 PRODUCTS

2.01 UVC EMITTERS

A. GENERAL
   1. Acceptable Manufacturers:
      a. Steril-Aire, Inc. Model RIK Series as shown on Schedule or Drawings.
      b. Architect approved equal and provide documentation by a recognized Industry Independent Testing Lab on substitute UVC Emitter performances. Performance results must meet or exceed the performance for Emitters specified in an HVAC environment.
   2. Quality Assurance:
      a. Qualifications: Each component and product are to be inbound and outbound tested before shipment in accordance with ISO 9001:2000 test procedures and shall be produced in an ISO 140001 approved facility.
      b. Output Verification: Independent certified testing shall indicate that when the RIK Emitter first installed total output per one inch arc length shall not be less than 7.8 $\mu W/cm^2$ at one meter, in a 400-fpm airstream of 50 °F.
   3. Warranty:
      a. Fixture and Emitter shall be 100% warranted to be free from factory defects for a period of one year. The Power Supplies and Fixtures shall be warranted for 5 years.
      b. The Coil shall be substantially free of Mold at the end of the manufacturer's Emitter warrantee period, or 9000 hours, whichever is longer.

B. DESIGN REQUIREMENT

1. Irradiation – UVC Emitters and fixtures are to be installed downstream of the coil horizontally across the full face of the coil in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan. UVC Emitter lamps shall be installed horizontally across the full width of the face of the coil (i.e., perpendicular to the coil fins) to minimize the shadowing effect of the coil fins.
2. Intensity- Intensity shall be measured by a UVC Radiometer that is accurate to ± 3% radiometric and photometric for NIST transfer standards in the monochromatic irradiance at 254nm. The Radiometer shall have a full cosine response filter.

C. EQUIPMENT

1. The Rapid Install Kit (RIK) System
   a. The Rapid Install Kit shall be factory assembled and tested. It shall consist of the following components: factory pre-wired power supplies with m12 connector cables and IP67 compliant female Emitter sockets, spring clips for each Emitter, foot bracket assembly, ceiling “H” bracket, adjustable aluminum columns, and all fasteners. All RIK’s include SJO cable between housings.
   b. The adjustable column shall be constructed of aluminum channel. It shall be designed for mounting inside the plenum.
   c. The column brackets (2) shall be constructed of galvanized steel. The “H” bracket shall be used with self-drilling, self-tapping screws to attach the column to the plenum ceiling. The foot bracket assembly shall be placed at the base of the column for height adjustment and non-slip footing in the drain pan.
   d. The housing shall be constructed of galvanized steel to withstand HVAC environments and shall be factory installed with 2 pre-wired110-277 V power supplies. The Emitter shall be held in place and supported in the airstream by Steril-Aire Mounting options.
   e. The power supply shall be a UL-935, Class P and Type 1 outdoor. The power supply design shall include RF and EMI suppression per FCC part 18. The power supply shall be designed to maximize photon production, irradiance supplies and reliability in cold airstreams of 0-140 °F, 100% RH. The power supply shall be available in a universal 110-277 V, 50/60 Hz, single phase. The power supply shall also have end of life protection.
   f. The Emitter shall be a very high output, hot cathode, T5 diameter, that produces germicidal UVC of 253.7 nm. The single-ended Emitter shall operate in air velocities of up to 2000 fpm and air temperatures of 35-140°F. It shall produce no ozone or other secondary contaminants.
   g. The socket shall be a 4-pin stepped type design constructed of UV Stabilized, Flame Retardant Polycarbonate with Silicone Rubber seals to achieve IP-67 protection at -40° to 125 °C.
2. Unitary System
   a. The Unitary Kit for Smaller Air Handlers shall be factory assembled and tested. The Kit shall consist of a power supply and a mounting solution. The single-ended Emitter shall be ordered separately.
   b. The power supply shall be a 25Watt unit with connector for Emitter. It shall be suitable for single-phase input power of either 120 volts or 230 volts (+/- 10%), 50 Hertz. The design shall include RF and EMI suppression. The power supply input wire length shall be 10”. The Emitter to power supply sleeved wire length shall be 14”.

c. The socket shall be a Circline® 4 pin type to facilitate connection to the Emitter for ease of installation and service.

d. The Emitter shall be a high output, hot cathode, T5 diameter, Circline cell-base type that produces a germicidal UVC band of 253.7 nm. The single-ended UVC Emitter shall be designed to maximize photon production, irradiance and reliability in cold air streams of 35-140 ºF, 99% RH and up to 2000 fpm. It shall produce no ozone or other secondary contaminants. Optional Emitter extension cords in 11" and 32" lengths (with connectors) shall be available.

e. The Mounting Solution: Steril-Aire provides a variety of mounting brackets for UVC Emitters. The Unitary Kit for Smaller Air Handlers includes one of the following mounting options: Short Hooks, Spring Clips, Flat Plate Lamp Holder (for metal), Flat Plate Lamp Holder (for plastic), Insert Lamp Holder, U Bracket – each packaged with mounting screws (as required) to facilitate installation in most major brands.
The power supply shall comply with ANSI/UL Standards 153, 1598 and 1995 and CSA standards. The manufacturer shall be an ISO. The supplier of the UVC system(s) shall provide documentation demonstrating the calculations for the specified minimum and average intensities for each UVC system as listed in the UVC Emitter Germicidal Lamp Disinfection Schedule during the submittal process.

D. System Design Performance:
The supplier of the UVC system(s) shall provide documentation demonstrating the calculations for the specified minimum and average intensities for each UVC system as listed in the UVC Emitter Germicidal Lamp Disinfection Schedule during the submittal process.

E. System Commissioning:

1. UVC system shall be commissioned by manufacturer field representative.
2. Commissioning shall verify system intensity level for each UVC system demonstrating that it has met or exceeded the minimum and average UVC intensities as specified. The commissioning shall be performed upon installation of UVC system for each AHU or RTU during operating conditions.
3. Points of measurements for UVC system minimum intensity shall be demonstrated by measuring at the four extreme corners (extreme position is defined as one square centimeter of coil at one corner of the area covered by the lamp) of the coil surface in the same plane as the irradiated surface. Additionally, points of measurements shall be taken every four (4) square feet across the face of the coil.
4. The average intensities shall be calculated by averaging the four (4) corner measurements with those measurements taken every four (4) square feet.
5. Intensity shall be measured by a UVC Radiometer that is accurate to ± 3% radiometric and photometric for NIST transfer standards in the monochromatic irradiance at 254nm. The Radiometer shall have a full cosine response filter. This measurement shall be used to verify compliance
6. Upon completion of the commissioning report demonstrating and verifying design intensity levels, actual recorded levels, and measurement locations all data shall be presented upon submission of an Operation and Maintenance Manual.

PART 3 INSTALLATION

3.01 INSTALLATION OF UVC EMITTERS

A. Coordinate with installation of HVAC equipment and install Emitters as indicated after such equipment is properly installed.

B. Provide an interlock switch on the access to the UVC Emitters to turn the lights off when the access is opened.

C. Provide a view port to enable the maintenance technician to view Emitters to determine that they are operating.

D. If specified to include a Steril-Aire stationary radiometer, install the radiometer and adjust and set in accordance with manufacturer recommendations.

E. Install an on/off indicator capable of informing BMS if there is an Emitter failure.

F. Install provided Caution Labels on all accesses to the Emitters.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING AND BALANCING FOR HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Testing, Balancing and Adjusting Heating, Ventilating, and Air Conditioning Systems.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for HVAC.

B. Section 23 0548 – Vibration and Seismic controls for HVAC Piping and Equipment.

C. Section 23 2113 – Hydronic Piping.

D. Section 23 3100 – HVAC Ducts and Casings.

E. Section 23 0923 – DDC System for HVAC.

1.03 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. ASHRAE - 2007 Systems Handbook: Chapter 37, Testing, Adjusting and Balancing.

C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.04 SUBMITTALS

A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

B. Submit test reports as a submittal under provisions of Section 01 3000 and Section 23 0500.

C. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.

D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

E. Provide reports in hard back, letter size manuals, complete with index page and indexing tabs, with cover identification at front and side.

F. Include detailed procedures, agenda, sample report forms prior to commencing system balance.

1.05 QUALITY ASSURANCE

A. Mechanical contractor may at his option perform hydrostatic pressure test and hydronic balancing of the HVAC piping systems.

B. Air Balance Subcontractor shall be a qualified representative of the Air Distribution Manufacturer whose devices are used on the project, or a qualified Independent Balancing Contractor. Air Balance Subcontractor may not be the Mechanical Contractor or the Sheet Metal Contractor on the project.

C. In order to be considered qualified, the Air Distribution Manufacturer shall include with air device shop drawings evidence of qualifications as follows:
   1. Resume of Air Balance Technician(s) to be used on the project including list of major air balance projects within the last five (5) years. Minimum acceptable experience shall be three (3) years as Air Balance Technician and five (5) projects similar in size and complexity.
   2. Resume of firm's experience in air balance and list of air balance projects within last five (5) years.
   3. Evidence of certification of calibration of equipment.

D. In order to be considered to be qualified, Independent Air Balance Contractor shall submit evidence of qualifications as follows:
   1. Resume of firm's experience in air balance representing a minimum of two (2) years as an Air Balance Contractor. Resume shall include a list of air balance projects within the last five (5) years.
   2. Resume of Air Balance Technicians(s) to be used on the project, including list of major air balance projects within last five (5) years. Minimum acceptable experience shall be three (3) years as Air Balance Technician and five (5) projects similar in size and complexity.
   3. Evidence of certification of calibration or equipment.

1.06 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Division 01.

B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

C. Schedule and provide assistance in final adjustment and test of life safety, smoke evacuation and/or smoke control system with Fire Authority.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. All measurements during air balance operations shall be made by means of the "Velometer" or "Anemometer" method. Instruments used for check of air quantities shall have recent certification of calibration.

B. The Air Balance Subcontractor shall furnish balance forms for all air systems. Forms shall list air distribution devices by location, system, size, pattern, CFM flow factor and required velocity.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the following:
   1. Equipment is operable and in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Correct fan rotation.
   7. Fire and volume dampers are in place and open.
   8. Coil fins have been cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage has been minimized.
   12. Hydronic systems have been flushed, filled, and vented.
   13. Correct pump rotation.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.

C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES

A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.

B. Adjust hydronic systems to plus or minus 10 percent of design conditions indicated.

3.04 ADJUSTING

A. Recorded data shall represent actually measured, or observed condition.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such

disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.05 HYDROSTATIC TEST

A. After completion of the installation, all piping shall be tested under 100 psi hydrostatic pressure, which shall be maintained for one hour without loss of pressure; after the system is proven tight and put in service, the contractor shall perform the equipment start-up and operating tests. All equipment shall be placed in complete operating condition subject to the approval of the Architect.

3.06 AIR BALANCE PROCEDURE

A. All air quantities shall, after completion of the job, be adjusted to provide air quantities shown on plans. After complete adjustment, additional re-adjustment shall be performed if necessary to satisfy desired temperature.

B. The balance procedure shall include the checking of each supply, return and exhaust fan. As a minimum, CFM, RPM and ampere readings shall be taken. Pulley adjustments, etc., shall be performed to obtain the required CFM readings.

C. Air Balance Subcontractor shall also furnish all balancing instruments required. Air Balance Subcontractor shall provide one experienced technician to team with Contractor's technician to balance system. The Air Balance Subcontractor's Technician and the Contractor's Technician shall perform as a team during the entire field balancing operation.

D. After all adjustments and corrections have been performed to balance system as designed and required, the Air Balance Subcontractor shall prepare and submit three (3) copies of completed balance form to Architect/Engineer for approval.

E. At the time of balancing, the Air Balance Contractor's Technician shall verify that each device is the size and pattern submitted and includes accessories such as volume controls and deflectrols where specified.

F. Where project includes controlled Air Terminal Units, the Terminal Unit Manufacturer's Supplier shall be responsible for testing the automatic control devices on the Terminal.

3.07 WATER BALANCE PROCEDURE

A. With all manual valves in fully open position and all control valves full flow to coil, adjust pump discharge valves to design flow on pumping systems.

B. Automatic flow control valves will balance flow to coils.

C. Balance flow through pumps at chillers, towers and boilers.

3.08 SYSTEM OPERATING TEST

A. After the successful completion of all equipment start-up and individual item test requirements, formal tests shall be performed on the complete Mechanical systems, measurements shall be made and reports prepared as specified below. Provide all instruments, materials and labor to perform the tests and to obtain and record the measurements specified herein, including the furnishing of all required record forms. Submit for the Architect's approval the form on which the measurements specified herein. Furnish all required record forms. Submit for the Architect's approval, complete shop drawings or catalog data for all instruments to be used for the 3-day operating test, and obtain approval at least two weeks before the forms and instruments will be required. Sample forms can be provided by the Architect if the Contractor requests.

B. First operating test by Contractor: Prove the operation of the Mechanical systems and of each individual item in the systems. At least 10 days' notice shall be given the Architect of such tests. Should any item of the systems fail to perform in an approved manner, this test shall be repeated until the operating test is approved by the Architect. During this test, balance circulation of steam, condensate, heating and chilled water, air and all other fluids conveyed to provide proper quantities to all items of equipment. Adjust and set all balancing cocks, valves, dampers and similar items to ensure that the systems perform as intended.

C. Checking by Owner and Architect: Following the successful completion of first operating tests by the Contractor, the Owner and Architect shall have the privilege of making such tests as they may desire during a period of three weeks to ascertain if any corrections are to be made to the system. At the end of the testing by the Owner and Architect, the Architect shall direct the Contractor in writing to make such corrections to the systems as are within the Scope of the contract.

D. Contractor's corrections to systems: Make all required corrections to the systems and notify the Architect in writing that the corrections outlined have been completed and give at least seven days' notice of a final 3-day operating test.

E. Three-day operating test: An operating test shall then be performed by the Contractor to the satisfaction of the Architect for a period of three days. Should any element of the systems not perform properly, the Contractor shall make all required corrections, and the test shall be repeated until successfully performed.

F. Measurements: Make the following measurements at two-hour intervals (5 measurements per 8-hour day) during the 3-day operating test.
1. Electrical: Running ampere and voltage of each motor 3/4HP or larger.
2. Air pressures at entrance and exit of each electronic air cleaner, filter, coil, fan and damper.
3. Air temperatures in each heated or air-conditioned space, at the entrance and exit of each coil, downstream from each pair of dampers where air of two different temperatures is mixed and outside the structure.
4. Relative humidity at location of each humidity sensor.
5. Water pressures at each pump suction and discharge and at entrance and exit of each convertor, and each heating and cooling coil.
6. Water temperature at entrance and exit of each convertor and each heating and cooling coil.
7. Domestic hot water supply temperature at the fixtures closest to and farthest away from the domestic hot water heater on each system (only once during 3-day test.
8. Running ampere and voltage on re-circulating pumps.
9. Static pressure of cold water line at building service connection (only once during 3-day test).

G. Report: Four copies of a written report of the 3-day operating test, on the approved form of record, shall be submitted to the Architect for approval and subsequent transmittal to the Owner.

END OF SECTION

SECTION 23 0713
DUCT INSULATION FOR HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Duct Insulation for HVAC Systems.

1.02 RELATED SECTIONS

A. Section 23 3100 – HVAC Ducts and Casings.

1.03 REFERENCES

A. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

B. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

C. ASTM E96 - Water Vapor Transmission of Materials.

D. NFPA 255 - Surface Burning Characteristics of Building Materials.

E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

F. Test standards and procedures for evaluating and rating performance of fire resistive and zero-inch clearance duct wrap systems.
   1. Underwriters' laboratories Inc., (UL):
      a. UL 723, Surface Burning Characteristics per ASTM E 84.
      b. UL 1978, First Edition of the Standard for Grease Ducts.
      c. UL 1479, Through-Penetration Firestop Test.
   2. American Society for Testing and Materials (ASTM):
      a. E119, Standard Method of Fire Test of Building Construction and Materials; 2-hour External Total Engulfment Test.
      b. E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.
   3. NFPA 96, 1994 Edition, Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 and Section 23 0500.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/100 in accordance with NFPA 255.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 0500.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553 and C612; flexible, noncombustible blanket.
1. "K" value: 0.27 at 75 degrees F.
2. Maximum service temperature: 250 degrees F.
3. Maximum moisture absorption: 0.20 percent by volume.
4. Density: 1.0 lb/cu ft.

B. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: 0.04 perm.
3. Secure with adhesive and tape.

C. Vapor Barrier Tape
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
1. "K" value: 0.24 at 75 degrees F.
2. Maximum service temperature: 350 degrees F.
3. Maximum moisture absorption: 0.20 percent by volume.
4. Density: 4.2 lb/cu ft.

B. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: 0.04 perm.
3. Secure with adhesive tape.

C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with

pressure sensitive rubber-based adhesive.

2.03 GLASS FIBER DUCT LINER, FLEXIBLE

A. Insulation: ASTM C553; flexible, bonded fibers, noncombustible blanket with edge coating.
   1. "K" value: 0.26 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Density: 1.5 lb/cu ft.

B. Adhesive:
   1. Waterproof, fire-retardant type.

C. Liner Fasteners: Galvanized steel, impact applied or welded with press on head conforming to Mechanical Fastener Standard MF-19/1.

2.04 FIRE-RATED DUCT INSULATION

A. A lightweight, non-asbestos, high-temperature inorganic foil encapsulated insulation blanket. Duct wrap system is used on commercial grease hood duct systems allowing a zero-inch clearance to combustible construction and as a 2-hour fire resistive rated enclosure system (shaft enclosure) when used with a listed or approved through-penetration system.

B. Performance Requirements:
   1. Two-hour rated fire resistive enclosure assembly, ASTM E119; Total Engulfment Test.
   2. Class 1 interior finish materials, ASTM E84
   3. Zero-inch clearance to combustibles, maximum allowable surface temperatures on unexposed side, UL 1978.
   4. Three-hour through-penetration protection systems for grease duct, ASTM E814 and UL 1479.

C. Materials
   1. FlameChek™ Duct Insulation.
   2. Tapes:
      a. High Performance Filament Tape: one-inch wide.
      b. Aluminum Foil Tape: to seal cut edges of blankets.
   3. Banding Material:
      a. Minimum 1/2 inch wide, .015 inch thick, type 304 stainless steel.
   4. Insulation Pins: 12 gage, minimum 4-1/2 inches long, Type 300 series stainless steel, with 1-1/2-inch square or round speed clips.
   5. Firestopping materials:
      a. Mesh: 304 stainless steel, .011 inch thick, 12 inches wide
      b. FlameChek™ Fiber Blanket
      c. Unifrax FryePutty
   6. Grease Duct Access Door, by duct fabricator:
      a. Door Enclosure:
         1) Steel angle opening frame.
         2) Access door cover, no less than 16 gauge.
         3) Insulation Pins.
         4) Speed Clips.
      b. Hardware:

1) Threaded rods: Minimum 4-1/2 inches long, 1/4-inch diameter galvanized steel with wing nuts and metal washers.
2) Steel tubing to fit over threaded rods, optional.
3) Wing nuts.

2.05 APPROVED MANUFACTURERS

A. Glass Fiber, Flexible:
1. Owens Corning Fiberglass, Type 100.
2. Architect Approved.

B. Glass Fiber, Rigid:
1. Owens Corning Fiberglass, Type 704.
2. Architect Approved.

C. Glass Fiber Duct Liner, Adjustable:
1. Certainteed Toughgard 150.
2. Architect Approved.

D. Grease Duct Insulation
1. Flamechek Duct Insulation, Certainteed Corporation.
2. Architect Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ductwork has been tested and joints and seams sealed, before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Insulated ductwork conveying air below or above ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Grease Duct
1. Apply two layers of FlameChek insulation with all seams and joints over lapped by 3 inches.
2. Off-set the longitudinal joint on the second layer by 10.5” from the first layer.
3. Secure the insulation to the duct using tape, SS bands, and insulation pins.
4. Follow all manufactures installation requirements for the installation of the insulation, transitions, hangers, access doors, and thru-penetrations.

D. Ducts external to the building shall be externally insulated with 2” thick rigid glass fiber insulation, cover with minimum .016” thick aluminum jacketing with waterproof seams.

Crown jacketing as required to shed water and seal. A covering equal to “Alumaguard” may be used in lieu of aluminum jacket.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 FLEXIBLE GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS
All supply, return and outside air ducts inside the building, unless noted otherwise.	2 inches
Dishwasher exhaust ductwork above ceiling.	2 inches

3.05 RIGID GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS
All ductwork external to the building (See Section 3.02, Paragraph D)	2 inches
All rectangular ductwork in Mechanical Rooms Provide canvas jacket.	2 inches

3.06 FLEXIBLE GLASS FIBER DUCT LINER INSULATION SCHEDULE

DUCTWORK	THICKNESS
All supply and return ductwork shown Crosshatched or with dashed lines on the Drawings	1 inch

3.07 FIRE RATED DUCT INSULATION

	THICKNESS
Range hood exhaust ductwork	(2) 1½” layers

END OF SECTION

SECTION 23 0716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

1.02 RELATED SECTIONS

A. Painting: Painting Insulation Covering - Section 09 9000.

B. Identification for HVAC Piping and Equipment - Section 23 0553.

C. HVAC Piping Insulation - Section 23 0719.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00 and Section 23 0500.

1.04 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible.
   1. ASTM C335, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.
   4. Density: 2.0 lb/cu ft. density.

B. Vapor Barrier Jacket
   1. ASTM C921, kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm.

C. Vapor Barrier Lap Adhesive
   1. Compatible with insulation.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible.
   1. K value: ASTM C335, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.1 percent by volume.
   4. Density: 3.0 lb/cu ft density.

B. Vapor Barrier Jacket:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm.

C. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

2.03 JACKETS

A. Canvas Jacket: UL listed
   1. Fabric: ASTM C921, 6 oz/sq yd, plain weave cotton treated with dilute fire-retardant lagging adhesive.
   2. Lagging Adhesive:
      a. Compatible with insulation.

2.04 APPROVED MANUFACTURERS

A. Glass Fiber, Flexible:
   1. Owens Corning.
   2. Architect Approved.

B. Glass Fiber, Rigid:
   1. Owens Corning.
   2. Architect Approved.

C. Vapor Barrier Lap Adhesive:
   1. Foster.
   2. Architect Approved.

D. Lagging Adhesive:
   1. Thixotropic.
   2. Architect Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

B. Install insulation for equipment requiring access for maintenance, repair, or cleaning, in such a manner that it can be easily removed and replaced without damage.

C. Insulate air separators and expansion tanks with 1½" thick fiberglass insulation. Finish with brush coat of white canvas or a spiral wrap of stretchable glass tape and a second coat of cement or lagging adhesive.

D. Insulate pipe connectors and expansion joints by filling linear voids with continuous wrappings of fiberglass insulation secured in place with copper wires. Complete assembly shall then be covered by a continuous wrap of two layers of ½" thick insulation to lap adjoining pipe insulation. The entire exposed surface shall then be continuous spiral wrapped with two separate and opposite wound layers of fiberglass fabric and sized with non-hardening vapor proof sealant.

E. Insulate chilled water pump impeller casing with a job-built insulation box which shall sit on the pump base plate and have openings for suction and discharge piping and the pump shaft. The insulation box shall be removable for pump servicing and shall have metal clips attached with sheet metal screws to attach it rigidly to the pump base. The insulation box shall be dual wall constructed of 16-gage sheet metal with a layer of one-inch-thick fiberglass insulation board with foil reinforced Kraft facing sandwiched between the sheet metal. Seal all seams and ends of insulation. Outside sheet metal panel and mating edges of top and bottom halves of insulation shall have finish layer of 8-ounce canvas applied with lagging adhesive.

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Piping Insulation for Heating, Ventilating, and Air Conditioning systems.

1.02 RELATED SECTIONS

A. Section 23 2113 – Hydronic Piping.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

H. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

I. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

J. ASTM E96 - Water Vapor Transmission of Materials.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 and Section 23 0500.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/100 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 23 05 00.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 PRODUCTS

2.01 GLASS FIBER

A. Insulation: ASTM C547; rigid molded, noncombustible.
1. "K" value: ASTM C335, 0.24 at 75 degrees F.
2. Minimum Service Temperature: -20 degrees F.
3. Maximum Service Temperature: 850 degrees F.
4. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket:
1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
3. Secure with adhesive applied to longitudinal laps and butt strips.
4. Secure with vapor barrier mastic.
5. Self-sealing laps may be used provided lap seal is additionally sealed with vapor barrier masters.

2.02 CELLULAR GLASS

A. Insulation: ASTM C552.
1. "K" value: 0.40 at 75 degrees F.
2. Maximum Water Vapor Transmission: 0.1 perm.

2.03 CELLULAR FOAM

A. Insulation: SASTM C534; flexible, cellular elastomeric, tubing.
1. “K” Value: ASTM C177 C518; 0.27 at 75 degrees F.
2. Minimum Service Temperature: -40 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent pipe by volume, .0 percent sheet by volume.

5. Moisture Vapor Transmission: ASTM E96, 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 25
8. Connection: Waterproof vapor barrier adhesive.

2.04 APPROVED MANUFACTURERS

A. Glass Fiber:
1. Owens/Corning Fiberglass.
2. Architect Approved - Other acceptable manufacturers offering equivalent products.

B. Vapor Barrier Jacket Lap Adhesive - Compatible with insulation:
1. Foster 25.
2. Architect Approved.

C. Cellular Foam:
1. Armstrong Armaflex - FR.
2. K-Flex USA.
3. Architect Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory applied or field applied.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
3. Finish with glass cloth and vapor barrier adhesive.
4. PVC fitting covers may be used.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe.
6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. For insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
3. Finish with glass cloth and adhesive.
4. PVC fitting covers may be used.
5. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Insert Location: Between support shield and piping and under the finish jacket.
3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

F. Finish insulation at supports, protrusions, and interruptions.

G. For 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 or stainless-steel jacket with seams located on bottom side of horizontal piping.

H. For buried piping, provide factory fabricated assembly with inner all-purpose service jacket with self sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

I. For 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.

J. Valves and fittings insulated with block insulation shall be finished with insulating cement and troweled to a smooth and uniform finish.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

	PIPING SYSTEMS	THICKNESS
A.	Heating Systems	
	Heating Water Supply and Return	
	Pipes 2” and larger	2 inches
	Pipes 1½” and smaller	1 inch
B.	Cooling Systems	
	Chilled Water (Conditioned Spaces)	
	Pipes 2” and larger	2 inches
	Pipes 1½” and smaller	1 inch
	Chilled Water (Unconditioned Spaces)	2 inches
	Humidity Drain Piping	½ inch

Note: Provide PVC jacket on all piping exposed in mechanical rooms.

END OF SECTION

SECTION 23 0923
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and will be used in conjunction with this Section as a part of the Contract Documents.

1.02 DESCRIPTION

A. General: The control system will be as indicated on the drawings and described in the specifications. The campus automation system shall connect to BACnet interfaces to perform monitoring and start/stop functions as outlined in control drawings.

B. The Direct Digital Control System (DDCS) will be designed such that each mechanical system will be able to operate under stand-alone control. In the event of a network communication failure, or the loss of any other controller, the control system will continue to independently operate under control.

1.03 QUALITY ASSURANCE

A. System Installer Qualifications - The Installer shall be Schneider Electric / Wade Company.

B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
   1. Underwriters Laboratories: Products will be UL-916-PAZX listed.
   2. National Electrical Code -- NFPA 70.
   3. Federal Communications Commission -- Part J.
   4. ASHRAE/ANSI 135-1995 (BACnet)

1.04 SUBMITTALS

A. Contractor will provide shop drawings and manufacturers= standard specification data sheets on all hardware and software to be provided.
   1. Project Record Drawings - As built version of the submittal shop drawings.
   2. Testing and Commissioning Reports and Checklists.
   3. Operating and Maintenance (O & M) Manual - These will be as-built versions of the submittal product data.

1.05 WARRANTY

A. Labor & materials for control system specified will be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period will be adjusted, repaired, or replaced at no charge or reduction in service to the Owner.

PART 2 PRODUCTS

2.01 BUILDING CONTROLLERS

A. General - The Building Automation System will be composed of one or more independent, stand-alone, microprocessor-based Building Controllers to manage the global strategies described in System software section. Data will be shared between networked Building Controllers.
   1. The controller will provide a communications port for connection to existing network.
   2. The Building Controller will be an Apogee Mechanical Equipment Controller of a TX10 Controller.
   3. The building controller shall include an operator interface for access to all functions defined in section 2.03.

B. Memory. The Building Controller will maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

2.02 CUSTOM APPLICATION CONTROLLERS

A. General - The Building Automation System will be composed of one or more independent, stand-alone, microprocessor-based Building Controllers to manage the local strategies described in System software section. Data will be shared between networked Controllers. The operating system of the Controller will manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
   1. Controller hardware will be suitable for the anticipated ambient conditions. Controllers used outdoors and/or in wet ambient will be mounted within NEMA Type 4 waterproof enclosures, and will be rated for operation at -40 F to 150 F. Controller used in conditioned ambient will be mounted in dust-proof enclosures, and will be rated for operation at 32 F to 120 F.
   2. Provide RS-232 connection for access to handler controller. Configure database so that HVAC technician may scroll through current status of all inputs and outputs and access local control of outputs for trouble shooting purposes. Provide password protection for all command procedures.

2.03 APPLICATION SPECIFIC CONTROLLERS

A. General – Terminal Equipment Controllers (TEC) are microprocessor-based DDC controllers which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable, but are customized for operation within the confines of the equipment they are designed to serve. Each TEC will be capable of stand-alone operation and will continue to provide control functions without being connected to the network.

B. Environment - Controllers used outdoors and/or in wet ambient will be mounted within NEMA Type 4 waterproof enclosures, and will be rated for operation at -40 F to 150 F. Controller used in conditioned ambient will be mounted in dust-proof enclosures, and will be rated for operation at 32 F to 120 F.

2.04 COMMUNICATIONS

A. The design of the BMS shall support networking of operator workstations and Building Controllers. The network architecture shall consist of two levels, an Ethernet based primary network for all operator workstations, servers, and primary DDC controllers along with secondary Floor Level Networks (FLN) for terminal equipment application specific

controllers.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.

C. Remote operator interface via a 9600 or faster baud modem will allow for communication with any and all controllers on this network. Communications services over the internetwork will result in operator interface and value passing that is transparent to the internetwork architecture.

D. The time clocks in all controllers will be automatically synchronized daily.

2.05 AUXILIARY CONTROL DEVICES

A Motorized dampers, unless otherwise specified elsewhere, will be as follows:

1. Damper frames will be 16-gauge galvanized sheet metal or 1/8-inch extruded aluminum with reinforced corner bracing.
2. Damper blades will not exceed 8 inches in width or 48 inches in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades will be not less than 16 gauge.
3. Damper shaft bearings will be as recommended by manufacturer for application.
4. All blade edges and top and bottom of the frame will be provided with compressible seals. Side seals will be compressible stainless steel. The blade seals will provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.
5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
6. Individual damper sections will not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

B. Control dampers will be parallel or opposed blade type as scheduled on drawings.

C. Electronic damper actuators.

1 The actuator will have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
2. Where indicated on the drawings or in the Sequence of Operations, for power-failure/safety applications, an internal mechanical, spring return mechanism will be built into the actuator housing.
3. All rotary spring return actuators will be capable of both clockwise or counter clockwise spring return operation. Linear actuators will spring return to the retracted position.
4. Proportional actuators will accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
5. All 24 VAC/DC actuators will operate on Class 2 wiring and will not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC will not require more than 11 VA.
6. All field installed non-spring return actuators will have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity will have a manual crank for this purpose.
7. All field installed modulating actuators will have an external, built-in switch to allow the reversing of direction of rotation.
8. All field installed actuators will be provided with a conduit fitting and a minimum

1m electrical cable and will be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

9. All field installed actuators will be Underwriters Laboratories Standard 873 listed.
10. Actuators will be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

D. Temperature Sensors:
1. Temperature sensors will be Resistance Temperature Device (RTD) or Thermistor.
2 Duct sensors in supply and return air will be rigid. Mixing sensors will be an averaging type with a minimum of 22 feet of length.
3. Immersion sensors will be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors will be equipped with set-point adjustment, and override switch as indicated in the sequence of operation.

E. Humidity Sensors:
1. Duct and room sensors will have a sensing range of 20% to 80% with accuracy of "5% RH
2 Duct sensors will be provided with a sampling chamber.
3. Outdoor air humidity sensors will have a sensing range of 20% to 95% RH It will be suitable for ambient conditions of -40 F to 170 F.
4. Humidity sensor's drift will not exceed 1% of full scale per year.

F. Static Pressure Sensors:
1. Sensor will have linear output signal. Zero and span will be field-adjustable.
2. Sensor sensing elements will withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.

G. Low Limit Thermostats:
1. Safety low limit thermostats will be vapor pressure type with an element 20 ft minimum length. Element will respond to the lowest temperature sensed by any one-foot section.
2. Low limit will be manual reset only. Low Limit will shut down unit through starter regardless of position of hand-off-auto switch. Low limit will also provide indication to the air handler controller for alarming through the DDCS.

H. Relays:
1. Control relays will be UL listed plug-in type with dust cover unless mounted in an enclosure. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays will be UL listed solid-state plug-in type with adjustable time delay. Delay will be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

I. Transformers and Power Supplies:
1. Control transformers will be UL listed, Class 2 current-limiting type, or will be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output will match the required output current and voltage requirements. Current output will allow for a 50% safety factor. Output ripple will be 3.0 mV maximum Peak-to-Peak. Regulation will be 0.10% line and load combined, with

50 microsecond response time for 50% load changes. Unit will have built-in over-voltage protection.

J. Current Switches:
1. Current-operated switches will be self-powered, solid state with adjustable trip current. The switches will be selected to match the current of the application and output requirements of the DDC system.

K. Local Control Panels:
1. All indoor control cabinets will be fully enclosed NEMA 1 Type construction with key-lock latch, removable sub-panels.
2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections will be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection will be individually identified per control drawings.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. All electrical work, including but not limited to installation of conduit, performed in the installation of the DDCS/ATC system as described in this specification will be per the National Electrical Code (NEC) and per applicable state and local codes. Where exposed, conduit will be run parallel to building lines properly supported and sized at a maximum of 40% fill.

B. In no cases will field installed conduit smaller than ¾" trade size be allowed. Where conductors are concealed (tenant spaces), cable rated for use in return air plenums will be used and properly supported from J-hooks. All conduit shall be installed per Division 26.

C. Follow manufacturer's instructions for interlocking unit controls to campus automation system.

3.02 SEQUENCE OF OPERATIONS – REFER TO DRAWINGS

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Hydronic Piping and Valves for the Heating, Ventilating, and Air Conditioning Controls.

1.02 RELATED SECTIONS

A. Section 23 0500 - Common Work Results for Heating, Ventilating, and Air Conditioning.

B. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Division 22 - All Sections.

1.03 REFERENCES

A. ANSI/ASME - Boiler and Pressure Vessel Code.

B. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

C. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.

D. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

E. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

F. ANSI/ASME B31.9 - Building Services Piping.

G. ANSI/AWS A5.8 - Brazing Filler Metal.

H. ANSI/AWS D1.1 - Structural Welding Code.

I. ANSI/AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

J. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

K. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

L. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

M. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

N. ASTM B32 - Solder Metal.

O. ASTM B88 - Seamless Copper Water Tube.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.9.

1.05 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9 and applicable state labor regulations.

B. Welders Certification: In accordance with ANSI/ASME SEC 9 and ANSI/AWS D1.1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 23 0500.

B. Store and protect products under provisions of Section 23 0500.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 PIPING

A. HEATING WATER PIPING
   1. Steel Pipe: ASTM A53 or A120, Schedule 40, for sizes 2-1/2 inches and over, black. Provide factory applied Epoxy protective coating for all buried piping.
      a. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, forged steel welding type
      b. Joints: Screwed, or ANSI/AWS D1.1, welded.
   2. Copper Tubing: ASTM B88, Type L, hard drawn, for sizes 2 inches and under.
      a. Fittings: ANSI/ASME B16.23 cast brass of ANSI/ASME B16.29 solder wrought copper.
      b. Joints: ASTM B32, solder, Grade 95TA.

B. CHILLED WATER PIPING, ABOVE GRADE
   1. Steel Pipe: ASTM A53 or A120, Schedule 40, for sizes 2-1/2 inches and over, black.
      a. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, forged steel welding type. Joints: Screwed for pipe 2 inch and under; ANSI/AWS D1.1 welded for pipe over 2 inch.
   2. Copper Tubing: ASTM B88, Type L, hard drawn for sizes 2 inches and smaller.
      a. Fittings: ANSI/ASME B16.23 cast brass or ANSI/ASME B16.29 solder wrought copper.
      b. Joints: ASTM B32, solder, Grade 95TA.

C. CONDENSING WATER PIPING
   1. Steel Pipe: ASTM A53 or A120, Schedule 40, for sizes 2-1/2 inches and over, black.
      a. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, forged steel welding type. Joints: Screwed for pipe 2 inch and under; ANSI/AWS D1.1 welded for pipe over 2 inch.

D. EQUIPMENT DRAINS AND OVERFLOWS
1. Copper Tubing: ASTM B88, Type M, hard drawn.
a. Fittings: ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
b. Joints: ASTM B32, solder, Grade 95TA.

E. FLANGES, UNIONS, AND COUPLINGS
1. Pipe Size 2-Inches and Smaller: Bronze for copper or brass pipe soldered joints.
2. Pipe sizes 2-1/2 Inches through 3-Inches: Cast brass flange type with gasket.
3. Pipe Sizes 4 Inches and Larger: Forged steel, weld neck, flanged unions with gasket.
4. Provide dielectric unions for connections joining dissimilar metals.

2.02 PIPING SPECIALTIES

A. MANUFACTURED PIPING SPECIALTIES
1. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.
2. Pipe Escutcheons:
a. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
b. Pipe Escutcheons for Moist and Wet Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
c. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
3. Low Pressure Y-Type Pipeline Strainers:
a. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64-inch perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping system.
b. Threaded ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
c. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
d. Available Manufacturers: Subject to compliance with requirements, manufacturers offering low pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:
American Air Filter, an Allis-Chalmers Co.
Armstrong Machine Works.
Hoffman Specialty, ITT Fluid Handling Div.
Metraflex Co.

Sarco Co., Div. of White Consolidated.
Trerice (H.O.) Co.
Victaulic Co. of America

4. High Pressure Y-Type Pipeline Strainers:
   a. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 250 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping systems.
   b. Threaded Ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
   c. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted steel retainer with off-center blowdown fitted with pipe plug.
   d. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:
      American Air Filter, an Allis-Chalmers Co.
      Armstrong Machine Works.
      Hoffman Specialty, ITT Fluid Handling Div.
      Metraflex Co.
      Sarco Co., Div. of White Consolidated.
      Trerice (H.O.) Co.
      Victaulic Co. of America
5. Dielectric Unions:
   a. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolates ferrous from non-ferrous piping (electrical conductance), present galvanic action, and stop corrosion.
   b. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dielectric unions which may be incorporated in the work include, but are not limited to, the following:
      Atlas Products Co.
      Capital Mfg. Co., Div. of Harsco Corp.
      Eclipse, Inc.
      Epco Sales, Inc.
      FMC Corp.
      McNally, Inc.
      PSI Industries.
      Stockham Valves and Fittings.

B. FABRICATED PIPING SPECIALTIES
1. Drip Pans: Provide drip pans fabricated from not less than 18-gauge corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2 inches. Reinforce top, either by structural angles or by rolling top over 1/4-inch steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
2. Pipe Sleeves: Provide pipe sleeves of one of the following:
   a. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3 inches and smaller, 20-gauge; 4 inches to 6 inches, 16-gauge; over 6 inches, 14-gauge.
   b. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

c. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe, remove burrs.

3. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
   a. Lead and Oakum: Caulked between sleeve and pipe.
   b. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mechanical sleeve seals which may be incorporated in the work include, but are not limited to following:
   Thunderline Corp.

2.03 VALVES

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.04 GATE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Comply with the following standards.
   1. Cast-Iron Valves: MSS SP-70.
   2. Bronze Valves: MSS SP-80.
   3. Steel Valves: ANSI B16.34.

C. For HVAC Hot and Chilled Water Service:
   1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, Milwaukee 1151.
   2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge, Milwaukee F-2886M.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following:
   1. Milwaukee Valve Company.
   2. Powell (Wm.) Co.
   3. Stockham Valves and Fittings, Inc.

2.05 GLOBE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal-seated globe valves, provide hardened stainless-steel disc and seat ring.

C. Comply with the following standard:
1. Cast-Iron Valves: MSS SP-85.
2. Bronze Valves: MSS SP-80.
3. Steel Valves: ANSI B16.34.

D. For HVAC Hot and Chilled Water Service:
1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, composition disc.
2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body, bolted bonnet, rising stem, OS&Y, renewable seat, and disc.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:
1. Milwaukee Valve Company.
2. Powell (Wm.) Co.
3. Stockham Valves and Fittings, Inc.

2.06 DRAIN VALVES

A. For Low Pressure Drainage Service:
1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4-inch hose outlet connection, Milwaukee 1152M.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:
a. Milwaukee Valve Company.
b. Powell (Wm.) Co.
c. Stockham Valves and Fittings, Inc.

2.07 BALL VALVES

A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

B. Comply with the following standards:
1. Steel Valves: ANSI B16.34.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball valves which may be incorporated in the work include, but are not limited to the, the following:
1. Milwaukee Valve Company.
2. Powell (Wm.) Co.
3. Stockham Valves and Fittings, Inc.

2.08 SWING CHECK VALVES

A. General: Construct pressure containing parts of valves as follows:
   1. Bronze Valves, 125 or 150 psi: ANSI/ASTM B62.
   2. Metallic Seated Bronze Valves, 200 or 300 psi: ANSI/ASTM B61.
   3. Iron Body Valves: ANSI/ASTM A126, Grade B.

B. Comply with MSS SP-71 for design, workmanship, material, and testing.

C. Construct valves of pressure castings free of any impregnating materials.

D. Construct valves of bronze, regrinding, with seating angle 40 degrees to 45 degrees, unless composition disc is specified.

E. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

F. Construct disc and hanger as separate parts, with disc free to rotate.

G. Support hanger pins on both ends by removable side plugs.

H. Install spring loaded check valves on discharge of all pumps.

I. For HVAC Hot and Chilled Water Service:
   1. Threaded Ends 2 inches and smaller: Class 125, bronze body, screwed cap, horizontal switch, bronze disc, Milwaukee 509.
   2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, Milwaukee 2974.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to, the following:
   1. Milwaukee Valve Company
   2. Powel Co (The Wm.)
   3. Stockham Valves and Fittings, Inc.

2.09 BUTTERFLY VALVES

A. Butterfly valves in chilled water supply and return piping, where shown on plans, shall be Demco Series NE, Milwaukee "M" Series, or approved equal. Ductile iron lug type body drilled and tapped for cap screws. Aluminum bronze disc; 416 stainless steel stems; Buna-N stem seals; Buna-N seat, field renewable type. Neck to provide handles or actuator clearance over 2 inches thick line insulation. Furnish set of ASA 150 Weld-Neck flanges and cap-screws for each valve. Valves shall have gear type handle.

2.10 VALVE FEATURES

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

B. Bypass: Comply with MSS SP-45, and except as otherwise indicated provide manufacturer's standard bypass piping and valving.

C. Drain: Comply with MSS SP-45, and provide threaded pipe plug complying with Division-15 "Pipe, Tube, and Fittings" section.

D. Flanged: Valve flanges complying with ANSI B16.5 (steel) or ANSI B16.24 (bronze).

E. Threaded: Valve ends complying with ANSI B2.1.

F. Butt-Welding: Valve ends complying with ANSI B16.25.

G. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

H. Wafer: Flangeless valves.

I. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.

J. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.

K. Renewable Seat: Design seat of valve with removable disc, and assembly valve so disc can be replaced when worn.

L. Extended Stem: Increase stem length by 2 inches minimum, to accommodate insulation applied over valve.

M. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment, and chain designed to provide mechanical advantage in operating valve.

N. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union, or welding.

O. Solid Wedge: One-piece tapered disc in gate valve, designed for contact on both sides.

P. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.

2.11 PLUG VALVES (COCKS)

A. Valve body shall be screw pattern, iron, except that sizes 1-1/4 inches through 2 inches shall be semi-steel, rated for 125 psig, non-shock W.O.G. operating pressure.

B. Plug shall be tapered, lubricated brass with square head operator.

C. APPROVED MANUFACTURERS
1. 1-inch and smaller - A. Y. McDonnel Manufacturing Company #10686.
2. 1-1/4 inches through 1-1/2 inches - Nordstrom #114.
3. 2-1/2 inches and larger - Nordstrom #115.
4. Architect Approved.

2.12 PRESSURE RELIEF VALVES

A. Body: Bronze or iron with testing lever.

B. Trim: Bronze or stainless steel.

C. Construction: Comply with ASME Code for Pressure Vessels, Section VIII and shall bear ASME stamp.

D. Maximum Permissible over Pressure: 25 percent (water).

E. APPROVED MANUFACTURERS
1. Bell and Gossett.
2. McDonnell Miller.
3. Kunkle Valve Company.

2.13 PRESSURE REDUCING VALVES

A. Body: Cast iron.

B. Trim: Bronze.

C. Rating: 125 psig working pressure at 200 degrees F.

D. Operator: Spring loaded diaphragm with adjustable range.

E. Diaphragms and Disc: Nitrile.

F. Pressure Reducing Valves - Water Service:
1. Spence Regulators - Type D 34.
2. Watts Regulators.
3. Architect Approved.

2.14 BACK FLOW PREVENTERS

A. Reduced pressure type. Rated 175 psig at 140 degrees F, manufactured in the United States of America.

B. Body:
1. Bronze construction.
2. Bronze body test cocks.
3. NPT body connections.
4. Non-rising stem gate valves.

C. Check Valve:
1. Celcon seats.
2. Rubber check valve.

D. Relief Valve:
1. Stainless steel seat.
2. Stainless steel shaft and flange bolts.

2.15 APPROVED MANUFACTURERS

A. Watts Regulator Series 909-SAG.

B. Wilkins Regulators.

C. Febco.

2.16 HORIZONTAL-PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

B. Adjustable Steel Clevises: MSS Type 1.

C. Steel Double Bolt Pipe Clamps: MSS Type 3.

D. Adjustable Swivel Pipe Rings: MSS Type 6.

E. Split Pipe Rings: MSS Type 11.

F. Extension Split Pipe Clamps: MSS Type 12.

G. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.

H. Pipe Stanchion Saddle: MSS Type 37, including steel pipe base support and cast-iron floor flange.

I. Adjustable Pipe Saddle Supports: MSS Type 38 including steel pipe base support and cast-iron floor flange.

J. Single Pipe Rolls: MSS Type 41.

K. Adjustable Roller Hangers: MSS Type 43.

2.17 VERTICAL-PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

B. Two-Bolt Riser Clamps: MSS Type 8.

C. Four-Bolt Riser Clamps: MSS Type 42.

2.18 HANGER-ROD ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed,

selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

B. Steel Turnbuckles: MSS Type 13.

C. Swivel Turnbuckles: MSS Type 15.

D. Malleable Iron Sockets: MSS Type 16.

E. Steel Weldless Eye Nuts: MSS Type 17.

2.19 BUILDING ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

B. Concrete Inserts: MSS Type 18.

C. Top Beam C-Clamps: MSS Type 19.

D. Side Beam or Channel Clamps: MSS Type 20.

E. Center Beam Clamps: MSS Type 21.

F. C-Clamps: MSS Type 23.

G. Top I-Beam Clamps: MSS Type 25.

H. Side I-Beam Clamps: MSS Type 27.

I. Steel I-Beam Clamps with Eye Nut: MSS Type 28.

J. Steel WF-Beam Clamps with Eye Nut: MSS Type 29.

K. Malleable Beam Clamps: MSS Type 30.

L. Steel Brackets: One of the following for indicated loading:
Light Duty: MSS Type 31.
Medium Duty: MSS Type 32.
Heavy Duty: MSS Type 33.

2.20 SADDLES AND SHIELDS

A. General: Except as otherwise indicated, provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Side saddles and shields for exact fit to mate with pipe insulation.

B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

2.21 MANUFACTURERS OF HANGERS AND SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hangers and supports which may be incorporated in the work include, but are not limited to the following:
C & S Mfg. Corp.
Carpenter and Patterson, Inc.
Elcen Metal Products Co.
F & S Central Mfg. Corp.
ITT Grinnell Corp.

2.22 MISCELLANEOUS MATERIALS

A. Metal Framing: Provide products complying with NEMA Std. ML 1.

B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A36.

C. Cement Grout: Portland cement (ANSI/ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C404, Size No. 2). Mix at a ratio of 1.0-part cement to 3 parts sand, by volume, with minimum amount of water required for placement and hydration.

D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for load required; weld steel in accordance with AWS standards.

E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), by cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

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.

D. After completion, fill, clean, and treat systems. Refer to Section 23 0500.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space and other work.

C. Group piping whenever practical at common elevations.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0500.

E. Provide clearance for installation of insulation, and access to valves and fittings.

F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

I. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Section 09 9000.

J. Install valves with stems upright or horizontal, not inverted.

3.03 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. Sweat solder adapters to pipe.

C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install spring loaded check valves on discharge of all pumps.

E. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

F. Use lug end butterfly valves as indicated.

G. Provide 3/4-inch gate drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.

H. The Contractor may at his option use copper pipe hydronic piping systems up through 3 inches, provided it conforms to this specification.

3.04 COPPER PIPE CONNECTIONS

A. Form hot brazed joints in copper, brass, or bronze fittings with lead-free solder.

B. Make connections to equipment and branch mains with unions.

C. Provide adapters in lines for valves and equipment. Bushings are not acceptable.

D. Provide water seal trap in drain near equipment. Pipe drain to nearest floor drain.

3.05 WELDED PIPE

A. Bevel pipe ends at a 37.5-degree angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.

B. Install welding rings and backing for each welded joint. Ring shall be as manufactured by Tube Turn, Inc., or approved equal.

C. Use pipe clamps or tack-weld joints with 1-inch-long welds; 4 welds for pipe sizes to 10 inches, 8 welds for pipe sizes 12 inches to 30 inches.

D. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

E. Do not weld-out piping system imperfections by tack-welding procedures; re-fabricate to comply with requirements.

F. Tees may be formed with Weld-O-Lets into mains or risers where branches are one-half or less than one-half the diameter of main or riser. Factory made fittings must be used for all larger branches.

3.06 FLANGED JOINTS

A. Match flanges within piping system, and at connections with valves and equipment.

B. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

3.07 INSTALLATION OF MANUFACTURED PIPING SPECIALTIES

A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2 inches and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment.
   Pumps.
   Steam traps serving steam main drips.
   Temperature control valves.
   Pressure reducing valves.
   Temperature or pressure regulating valves.

C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.08 INSTALLATION OF FABRICATED PIPING SPECIALTIES

A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1 inch drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

B. Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface except floor sleeve. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
   1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
   2. Install iron-pipe sleeves at exterior penetrations, both above and below grade.
   3. Install steel-pipe sleeves except as otherwise indicated.

C. Sleeve Seals: Install in accordance with the following:
   1. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

3.09 VALVE INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements.
   1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
   2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

E. Mechanical Actuators: Install mechanical actuator with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler rooms; and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.

F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections.
   1. Pipe Size 2 inches and smaller: One of the following, at Installer's option:
      a. Threaded valves.
      b. Grooved-end valves (Fire Protection Only).
      c. Flanged valves.
   2. Pipe Size 2-1/2 inches and larger: One of the following, at Installer's option:
      a. Grooved-end valves (Fire Protection Only).
      b. Flanged valves.

G. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

H. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

I. Renewable Seats: Select and install valves with renewable seats except where otherwise indicated.

J. Fluid Control: Except as otherwise indicated, install, gate, ball, globe and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valve.

K. Installation of Check Valves:
   1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
   2. Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
   3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
   4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers where shown on the plans with elbow and air gap, and as may be required to prevent cross contamination of potable water systems.

B. Pipe discharge drain to nearest floor drain.

3.11 PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

B. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.12 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations, within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-59. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.13 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
   1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
   2. Support fire-water piping independently of other piping.
   3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

B. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion bends and similar units.
   2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
   3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install galvanized coated protective shields. Install Foam-Glas insulation saddles.
3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.14 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximum recommended by manufacturer for each unit.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.15 ADJUSTMENT OF HANGERS AND SUPPORTS

A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

3.16 EQUIPMENT BASES

A. Concrete housekeeping bases will be provided as work of Division 3. Furnish to Contractor, scaled layouts of all required bases with dimensions of bases, and location to column center lines. Furnish templates, anchor bolts, and accessories, necessary for base construction.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Structural steel stands to be supported from housekeeping pad bases. Steel supports shall not be allowed to be in direct contact with slab floors.

END OF SECTION

SECTION 23 2114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Hydronic Specialties for Heating, Ventilating, and Air Conditioning System.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating, and Air Conditioning Controls.

B. Section 23 0548 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 2113 – Hydronic Piping.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacturer of hydronic specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. ASTM Code: Comply with all ASTM codes pertaining to valves and tanks.

C. MSS Standards: Valves and Fittings to comply with the Manufacturer's Standardization Society of the Valve and Fittings Industry.

D. U.S.A.S.I. - Equipment provided under this section to comply with all applicable codes of the United States of America Standards Institute.

E. ASME Code - Comply with requirements of the American Society of Mechanical Engineers "Boiler Construction and Unfired Pressure Vessel Code".

1.04 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of manufactured hydronic specialty. Include pressure drop curve or chart for each type and size of hydronic specialty. Submit schedule showing capacities, and features for each required hydronic specialty.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured hydronic specialty. Include this data in Maintenance Manual.

C. Hydronic Specialty Types: Provide hydronic specialties of same type by same manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURED HYDRONIC SPECIALTIES

A. General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types, capacities, and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type cannot be used on project.

B. Balance Valves:
1. General: Provide balance valves as indicated, of one of the following types.
   a. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, ball type with memory stop, straight pattern.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering balance valves which may be incorporated in the work include, but are not limited to, the following:
   Bell & Gossett.
   ITT Fluid Handling Div.
   Hammond Valve Corp., Div, of Convall Corp.
   Illinois Products, American Air Filter Co., Inc.
   Milwaukee Valve Co., Inc.
   Sarco Co., Div. of White Consolidated.
   Taco, Inc.

C. Vent Valves:
1. Manual Vent Valves: Provide manual vent valves designed to be operated manually with screwdriver or thumbscrew, 1/8-inch N.P.T. connection; 1/4-inch NPT connection for vent valves remote from point of venting.
2. Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, cast-iron body, pressure rated for 125 psi, 1/2-inch N.P.T. inlet and outlet connections.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering vent valves which may be incorporated in the work include, but are not limited to, the following:
   Armstrong Machine Works.
   Bell & Gossett, ITT Fluid Handling Div.
   Hoffman Specialty, ITT Fluid Handling Div.
   Sarco Co., Div. of White Consolidated.
   Wheatley.

D. Air Separators:
1. Furnish and install as shown on the drawings a Spirovent coalescing type or approved equal centrifugal type air separator on the hot and chilled water systems. Pipe size is not a factor in selecting air separators and appropriate reducers shall be furnished to connect to piping as shown on the drawing. All separators shall be fabricated steel, rated for 150 psig design pressure and be selected at their point of peak efficiency in accordance with manufacturer's published catalog data. Entering velocity at the pipe connections shall not exceed 2 feet per second at specified GPM for centrifugal type separators and 4 feet per second for coalescing type. Spirovent "HV" separators specifically designed for high velocity systems may have an entering velocity of up to 10 feet per second. Coalescing type separators shall include internal copper coalescing medium to reduce velocity, facilitate maximum air elimination and suppress turbulence. Centrifugal type shall have a 3:1 vessel diameter to pipe connection ratio to reduce velocity and be furnished with galvanized steel strainer and

stainless-steel collector tube for air separation and collection. Provide integral high-capacity float actuated air vent at top fitting of tank. Alternates to integral vent shall include cast iron float actuated air vent rated at 150 psig, which shall be threaded to the top of the separator. Unit shall have bottom blow down connection.
Spirovent.
Thrush
Taco, Inc.
Architect Approved Equal.

E. Diaphragm-Type Compression Tanks:
1. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles. Bladder shall be replaceable. Tank sized for partial acceptance.
2. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering compression tanks and tank fittings which may be incorporated in the work include, but are not limited to, the following:
Wheatley
Armstrong Pumps, Inc.
Bell & Gossett, ITT Fluid Handling Div.
Taco, Inc.
Thrush Div.,

F. Shot Feeders:
1. General: Provide shot feeders of 5 gal. capacity or otherwise as indicated, constructed of cast iron or steel, for introducing chemicals in hydronic system. Provide funnel and valve on top for loading, drain valve in bottom, and recirculating valves on side. Construct for pressure rating of 125 psi.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering shop feeders which may be incorporated in the work include, but are not limited to, the following:
Culligan USA.
Vulcan Laboratories, Subsidiary of Clow Corp.
Mogul

G. Water Relief Valves:
1. General: Provide water relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
a. Pressure Relief Valves: Bronze body, test lever, A.S.M.E. rated. Provide pressure relief at 30 psi, or as noted on flow diagrams.
2. Available Manufacturers: Subject to Compliance with requirements, manufacturers offering water relief valves which may be incorporated in the work include, but are not limited to, the following:
Wheatley
Bell & Gossett, ITT Fluid Handling Div.
Sarco Co., Div. of White Consolidated.
Watts Regulator Co.

H. Pressure Reducing Valves:

1. General: Provide pressure reducing valves as indicated, of size and capacity as selected by Installer to maintain operating pressure on boiler system.
2. Construction: Cast iron or brass body, low inlet pressure check valve, inlet strainer removable without system shut-down, non-corrosive valve seat and stem, factory set at operating pressure.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure reducing valves which may be incorporated in the work include, but are not limited to, the following:
   Wheatley
   Armstrong Pumps, Inc.
   Bell & Gossett, ITT Fluid Handling Div.
   Taco, Inc.

I. Flow Limiting Valves:
1. The automatic flow control valve shall be factory set to limit the flow rate as specified, regardless of system pressure fluctuation. The valve must be accurate within plus or minus 5 percent of the factory calibrated flow rate.
2. All internal working parts shall be passivated stainless steel. Plated internal parts are not acceptable. Body pressure tappings suitable for pressure and temperature gage installation and verification of pressure differential across valve orifice shall be provided.
3. The safe maximum working pressure and temperature of valve shall be 200 psi and 250 degrees F.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering flow limiting valves which may be incorporated in the work include the following:
   Griswold.
   Architect approved equal.

PART 3 EXECUTION

3.01 INSTALLATION OF MANUFACTURED HYDRONIC SPECIALTIES

A. Balance valves:
1. General: Install on each hydronic terminal and elsewhere as indicated. After hydronic system balancing has been completed, mark each balance valve with stripe or yellow lacquer across body and stop plate to permanently mark final balanced position.

B. Vent Valves:
1. Manual Vent Valves: Install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of flow for mains, branches, and runouts, and elsewhere as indicated. Locate manual vent valves remote from vent point where indicated.
2. Automatic Vent Valves: Install automatic vent valves at top of each hydronic riser and elsewhere as indicated. Install shutoff valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.

C. Air Separators:
1. Combination Separator/Strainer: Install external combination /strainers in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank pitched towards tank at 1 inch rise in 5-foot run (1.7%). Install blowdown valve and piping. Remove and clean strainer after 25 hours and again after 30 days of

system operation.

D. Compression Tanks:
1. General: Install compression tanks on housekeeping pad for tank fully loaded, or otherwise as indicated. Install cocks on end of tank.

E. Shot Feeders:
1. General: Install shot feeders on each hydronic system at pump discharge and elsewhere as indicated. Install in upright position with top of funnel not more than 48 inches above floor. Install globe valve in pump discharge line between recirculating lines. Pipe drain to nearest plumbing drain or as indicated.

F. Water Relief Valves:
1. General: Install on hot water generators, and elsewhere as indicated. Pipe discharge to floor. Comply with ASME Boiler and Pressure Vessel Code.

G. Pressure Reducing Valves:
1. General: Install for each hot water boiler or heat exchanger as indicated, and in accordance with manufacturer's installation instructions.

H. Flow Limiting Valves:
1. Install where indicated on the drawings. Valve shall be tamperproof upon installation. Ensure valves are installed in proper direction of airflow.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Hydronic Pumps for HVAC Systems.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating and Air Conditioning.

B. Section 23 0548 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 2113 – Hydronic Piping.

D. Division 23 – All Sections.

1.03 REFERENCES

A. ANSI/UL 778 - Motor Operated Water Pumps.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture, assembly and field performance of pumps, whose products have been in satisfactory use in similar service.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright and alignment certified.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of 01 33 23 and Section 23 05 00.

B. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

C. Submit manufacturer's installation instructions under provisions of Division 01.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 05 00.

B. Include installation instructions, assembly views, lubrication instructions and replacement parts list.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 23 05 00.

B. Store and protect products under provisions of Section 23 05 00.

1. 08 EXTRA PARTS

A. Provide one extra set of mechanical seals for each pump.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION REQUIREMENTS

A. Balance: Rotating parts, statically and dynamically.

B. Pump Motors: Operate at 1750 rpm unless specified otherwise.

C. Pump Connections: Flanged.

2.02 SPLIT COUPLED BASE-MOUNTED END SUCTION PUMPS

A. The pump shall be single, end suction type with radically split, top center-line discharge, self-venting casing. The casing-to-cover gasket shall be confined on the atmospheric side to prevent blow-out possibility.

B. Pump construction shall be cast iron, bronze fitted and shall be fitted with a long- life, product lubricated, drip-tight mechanical seal, with O-ring seat retainer, designed for the specified maximum temperature and pressure.

C. The casing suction and discharge connections shall be the same size and shall be provided with drilled and tapped seal vent and pressure gauge connections.

D. Pump impeller shall be stainless steel or bronze, fully enclosed type. Impeller shall be dynamically balanced.

E. The shaft shall be fitted with a Stainless-Steel shaft sleeve and be supported by two heavy duty ball bearings. The design shall allow Back Pull-Out servicing, enabling the complete rotating assembly to be removed without disturbing the casing piping connections.

F. The pump shall be mounted on a rigid, single piece baseplate, with grouting hole, and connected by flexible coupling with guard, to a 460U, 3 phase, inverter duty motor of Federal approved premium, efficiency level and suitable for across-the-line starting.

G. The housing shall be hydrostatically tested to 150% maximum working pressure.

H. The unit shall be suitable for the conditions shown on the pump schedule.

2.04 SPLIT COUPLED VERTICAL IN-LINE PUMPS

A. Pump casing shall be cast iron, suitable for 175 psi (1206 kPa) working pressure at 140°F (60°C). Ductile iron pump casings are suitable for pressures to 250 psi (1724 kPa). The casing shall be hydrostatically tested to 150% maximum working pressure. The pump internals shall be capable of being serviced without disturbing the pipe connections. The casing suction and discharge connections shall be the same size and shall be provided with drilled and tapped seal vent and pressure gauge connections.

B. Pump impeller shall be stainless steel or bronze, fully enclosed type. Impeller shall be

dynamically balanced.

C. A bronze shaft sleeve, extending the full length of the mechanical seal area, shall be provided.

D. Mechanical Seal shall be single spring inside type with carbon against Ceramic faces. EPDM elastomer with stainless steel spring and hardware shall be provided. Seal vent line shall be factory installed and shall be piped from the seal area to the pump suction connection.

2.05 BOILER CIRCULATION PUMPS

A. Pump casing shall be cast iron, suitable for 125 psi (862 kPa) working pressure at 210°F (99°C). The casing shall be hydrostatically tested to 150% maximum working pressure. The pump internals shall be capable of being serviced without disturbing the pipe connections. The flanged casing suction and discharge connections shall be the same size and shall be provided with drilled and tapped seal vent and pressure gauge connections where available.

B. Pump impeller shall be non-metallic, as part of a self-lubricating replaceable cartridge design. Impeller shall be dynamically balanced. Entire cartridge shall be able to be replaced without removing the pump body from the piping connections.

C. A ceramic shaft bearing shall be provided.

2.06 APPROVED MANUFACTURERS

A. Armstrong

B. Bell & Gossett

C. Taco

D. Engineer Approved

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pumps in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. 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.

D. Provide drains for bases and seals, piped to and discharging into floor drains.

E. Lubricate pumps before start-up.

F. Install base mounted pumps on concrete inertia base, with anchor bolts, set and level.

G. Qualified millwright shall check, align, and certify base mounted pumps prior to start-up.

END OF SECTION

SECTION 23 2300
REFRIGERANT AND CONDENSATE PIPING

PART 1 GENERAL

1.01 SCOPE

A. Interconnecting piping between evaporator coil and heat pump unit on split system units.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Common Work Results for HVAC - Section 23 0500.

B. HVAC Piping Insulation - Section 23 0719.

1.03 REFERENCES

A. ASHRAE Standard 15 – Safety Code for Mechanical Refrigeration.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING:

A. Type "L", hard drawn copper (degreased), with long radius soldered elbows.

2.02 CONDENSATE PIPING:

A. Type "L", hard drawn copper (degreased).

2.03 FITTINGS

A. Wrought copper.

2.04 SOLDER

A. Brazing alloy with 1000 °F melting point and suitable flux.

2.05 VALVES

A. Pack-less bellows or diaphragm type for use with Freon type refrigerant.

2.06 APPROVED MANUFACTURERS

A. Valves:
   1. Mueller Brass Company.
   2. Kerotest Mfg. Co.
   3. Engineer Approved.

B. Solder:
   1. Phoson Fifteen.
   2. Sil-Fos.
   3. Engineer Approved.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space and other work.

C. Group piping whenever practical at common elevations.

D. Provide clearance for installation of insulation, and access to valves and fittings.

E. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Install refrigerant accessories as shown on the drawings and as may be recommended by the unit manufacturer.

I. Provide double suction risers and pitch lines as required to insure positive oil return to compressor.

J. Testing shall be done during progress of work or at completion to insure tight system. Charge the system with dry nitrogen and soap test hot gas lines at 300 psi and liquid and suction lines at 245 psi. Allow system to stand for 24 hours under pressure and if no change in pressure, system may be considered tight.

K. Before charging, evacuate the system to 0.15 inches of mercury absolute pressure. All pumps to operate at least four (4) hours at this reading.

3.02 COPPER PIPE CONNECTIONS

A. Form hot brazed joints in copper, brass, or bronze fittings with lead-free solder.

B. Make connections to equipment and branch mains with unions.

C. Provide adapters in lines for valves and equipment. Bushings are not acceptable.

3.03 REFRIGERANT CONTAINMENT

A. Contractor shall take all necessary precautions to prevent the accidental or intentional release of refrigerant to the atmosphere.

B. When a sealed system must be broken, provide all necessary equipment and containers as required to pump down the entire system volume, or that volume not contained in isolated receivers on the equipment.

C. Contractor shall clean and re-use refrigerant to the greatest extent possible. Un-used refrigerant shall be properly disposed of or recycled at the contractor's expense.

D. Provide all sleeving and venting of refrigerant piping required by code and AHJ to ensure complete compliance with ASHRAE Standing 15 for A2L type refrigerants.

E. Provide refrigerant monitoring systems as required for compliance.

END OF SECTION

SECTION 23 2500
HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SCOPE

A. Chilled, condensing and heating water systems cleanout and preparation.

B. Chilled, condensing and heating water systems treatment.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Basic Mechanical Requirements - Section 23 0500.

B. Testing, Adjusting and Balancing - Section 23 0593.

1.03 COORDINATION

A. All power, motor and interlock wiring required for solution pumps, timers, monitors, etc., shall be furnished, whether shown or not, at no additional cost.

B. Coordinate exact locations and power requirements with the electrical contractor and other trades as required to avoid omissions or conflicts.

C. Mechanical contractor shall install all equipment. Water treatment contractor shall supervise the cleaning of hydronic and steam piping systems. Provide certification for each system when cleanout is completed.

1.04 QUALITY ASSURANCE

A. Chemicals, service and equipment shall be supplied by a single water treatment company for undivided responsibility.

B. The bid for chemicals, service and equipment shall be as recommended and furnished by the water treatment company based upon a complete analysis of the water from the site.

C. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment for at least five (5) years, whose major business is in the field of water treatment, and shall have regional water analysis laboratories, development facilities and service department.

D. The necessary chemical formulations and testing shall be as directed by the supplier.

E. Water treatment supplier shall provide cleanout of new piping and equipment and treatment of new water back to acceptable levels for conformation of existing treatment program.

PART 2 PRODUCTS

2.01 CHEMICAL SHOT FEEDERS

A. Equal to 5-gallon, one-shot feeder, complete with isolation valves and inlet fill funnel if required.

2.02 IN PLANT TESTING

A. Provide all necessary chemical testing equipment and reagents for in-plant testing. Equipment and reagents shall be provided for each system and shall be furnished in a sturdy case labeled with system name (i.e. "CHILLED WATER").

B. Supply all log sheets for recording of test results and treatment used. Furnish a Vinyl covered, hardback, 3-ring binder with label on spine "WATER TREATMENT TEST LOG". Include printed instructions for each type of test and tab dividers for each section.

2.03 APPROVED MANUFACTURERS

A. Coordinate with Owner’s existing programs. Chem-Aqua.

PART 3 EXECUTION

3.01 Provide all necessary chemical testing equipment and reagents for in plant testing. Supply all log sheets for recording of test results of treatment used.

3.02 CHILLED, CONDENSING, AND HEATING WATER SYSTEM - TREATMENT

A. Install a one-shot feeder, if required, that meets the pressure requirements of the specified system.

B. Provide automatic feed and monitoring systems as may be required based upon initial water analysis.

C. Provide the chemical formulations required to inhibit scale and corrosion, together with written instructions for dosages, application procedures and testing.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for HVAC Ducts and Casings.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating, and Air Conditioning System.

B. Section 23 0548 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 0593 – Testing, Adjusting and Balancing.

D. Section 23 0713 – Duct Insulation.

1.03 QUALITY ASSURANCE

A. Installer: A firm with at least 3 years of successful installation experience on projects with low pressure ductwork systems work similar to that required for project.

B. SMACNA Standards: Comply with SMACNA HVAC Duct Construction Standards for fabrication and installation of low-pressure ductwork.

C. NFPA Compliance: Comply with ANSI/NFPA 9OA Standard for the Installation of Air-Conditioning and Ventilating Systems" and ANSI/NFPA 90B "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems" and ANSI/NFPA96 "Standard for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".

D. Field Reference Manual: Have available at project field office, copy of "SMACNA HVAC Duct Construction Standards", latest Edition.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications on manufactured products and factory-fabricated ductwork, used for work of this section.

B. Record Drawings: At project closeout, submit record drawings of installed ductwork, duct accessories, and outlets and inlets, in accordance with requirements of Division 01.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 PRODUCTS

2.01 LOW PRESSURE DUCTS

A. Ductwork Materials
   1. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.
   2. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lock forming quality, with ANSI/ASTM A 525, G9O zinc coating; mill phosphatized for exposed locations.

B. Miscellaneous Ductwork Materials
   1. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
   2. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Hardcast tape or approved equal.
   3. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
      a. Except where space is indicated as "High Humidity" area, interior support materials of not less than l/4" diameter or 3/16" thickness may be plain (not galvanized).

C. Flexible Duct
   1. Flexible duct may be used in lengths not over 3'-0" to connect terminal units. Flexible duct shall not be used to turn elbows in excess of 45 degrees.
   2. Flexible duct shall meet U.L. 181 and conform to NFPA 9OA and 90B and be installed in accordance with the conditions of their listing by U.L. as a flexible duct.
   3. Installation shall conform to SMACNA "HVAC Duct Construction Standards", Section III, latest edition.

D. Fabrication
   1. Shop fabricate ductwork in 4, 8, 10 or 12-foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
   2. Shop fabricated ductwork if gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards", First Edition, 1985.
   3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with centerline radius equal to associated duct width; and fabricate to including turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. The contractor may use square 90-degree elbows with turning vanes in lieu of centerline radius turns.
   4. Fabricate ductwork with accessories installed during fabrication to the greatest

extent possible. Refer to Division-15 section "Duct Accessories" for accessory requirements.

E. Factory-Fabricated Ductwork
1. General: As installer's option, provide factory- fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
2. Material: Galvanized sheet steel complying with ANSI/ASTM A 527, lock-forming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized.
3. Gauge: 26 ga. minimum for round ducts and fittings, 4-inch through 24-inch diameter.
4. Elbows: One piece construction for 90 degree and 45-degree elbows 14 inches and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
5. Divided Flow Fittings: 90-degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.
6. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory-fabricated ductwork which may be incorporated in the work include, but are not limited to, the following:
United Sheet Metal Div., United McGill Corp.
Semco Manufacturing, Inc.
Sheet Metal Products, Inc.

2.02 HIGH PRESSURE DUCTWORK

A. Ductwork Materials
1. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.
2. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lock forming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.

B. Miscellaneous Ductwork Materials
1. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
2. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15-degree change of direction per section. Unless specifically detailed otherwise, use 45-degree laterals and 45-degree elbows for branch take-off connections. Where 90-degree branches are indicated, provide conical type tees.
3. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
4. Duct Cement: Non-hardening migrating mastic or liquid neoprene-based cement (type applicable for fabrication/installation detail) as compounded by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

C. Fabrication
1. Shop fabricate ductwork in 4, 8, 10 or 12-foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent

necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

2. Shop fabricates ductwork of gauges and reinforcement complying with SMACNA HVAC Duct Construction Standards for 4” pressure class ductwork.
3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.
4. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-15 section "Duct Accessories" for accessory requirements.

D. Factory-Fabricated Ductwork

1. General: At installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
2. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 527 by the

Diameter	Minimum Gauge	Method of Manufacturer
3" to 14"	26 ga.	Spiral Lock seam
15" to 26"	24 ga.	Spiral Lock seam
27" to 36"	22 ga.	Spiral Lock seam
37" to 50"	20 ga.	Spiral Lock seam

   a. Provide locked seams for spiral duct; fusion-welded butt seam for longitudinal seam duct.
   b. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seam.

Diameter	Minimum Gauge
3" to 36"	20
38" to 50"	18
Over 50"	16

3. Flat-Oval Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 527, of spiral lock-seam construction, in minimum gauges listed.

Maximum Width	Minimum Gauge
Under 25"	24
25" to 48"	22
49" to 70"	20
Over 70"	18

   a. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous weld along seams.

Maximum Width	Minimum Gauge
Under 37"	20
37" to 50"	18

Over 50"	16

4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory-fabricated ductwork which may be incorporated in the work include, but are not limited to, the following:

   United Sheet Metal Div, United McGill Corp.
   Semco Manufacturing, Inc.
   Sheet Metal Products Co.

2.03 DUAL WALL DUCT AND FITTINGS

A. Dual wall duct shall be comprised of an airtight outer pressure shell, a 2-inch insulation layer, and perforated metal inner liner. Liner shall be supported from the steel by welded spacers. Where indicated on the drawings, ductwork shall have 3 inches of insulation for sound attenuation.

B. Insulation shall completely fill the space between the liner and outer shell and have the following UL ratings:

Flame Spread	10-20
Fuel Contributed	10-15
Smoke Developed	0-20

C. Outer shell of duct shall be minimum 20-gage galvanized steel. Inner liner of duct shall be minimum 28-gage galvanized steel.

D. Manufactured end fittings shall be installed at all connections of dual wall and single wall duct.

E. All round and oval ductwork shall be spiral lock seam pipe. The spiral pipe shall have been laboratory tested for leakage rate, friction loss, bursting and collapsing strength.

F. Fitting shall be of the standard machine-formed fittings as manufactured by the duct manufacturer. Fittings shall match those shown on the drawings as closely as possible. All fittings shall have a turning radius of 1-1/2 times the diameter of the duct where possible.

G. Provide “paint grip” finish where indicated on drawings.

2.04 RANGE HOOD AND DISHWASHER HOOD EXHAUST DUCTS

A. Range hood exhaust ducts shall be 14-gauge welded steel. Duct construction, joints, cleanouts and installation shall comply with Chapter 5 of the Arkansas Mechanical Code.

B. Dishwasher hood exhaust ductwork shall be 16-gauge aluminum with all joints and seams welded.

C. Insulate range hood exhaust ducts per Section 23 0713.

D. Insulate dishwasher hood exhaust ducts with 2” wrap-on insulation as specified in Section 23 0713.

2.05 DRYER VENTS

A. Dryer vent duct shall have smooth interior finish with joints running in direction of airflow.

B. Dryer vents shall not be assembled with sheet metal screws or other means which extend into the duct. Seal each joint with non-combustible material.

C. Provide vent cap with back draft damper and no screen. See detail on plans.

D. Provide Complete UL listed kit with everything needed to connect dryer to wall vent
- Close fit for 4-in wall clearance.
- 6-ft of flexible pipe.
- 2 close elbows resist crushing and maintain airflow.
- Swivel cuffs on close elbows allow moving dryer without disconnecting.
- Conforms to UL safety requirements.

2.06 FUME HOOD EXHAUST DUCTS

A. Furnish and install all exhaust ducts from laboratory fume hoods as indicated on the Drawings.

B. All rectangular or round pipe fume hood ductwork and fittings shall be constructed of Type 316 stainless steel with heliarc welded seams.

PART 3 EXECUTION

3.01 LOW PRESSURE DUCTWORK

A. Installation of Ductwork

1. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (1% leakage) and noiseless (no objectional noise) systems, capable for performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.
2. Seal ductwork, to class recommended, and method prescribed in SMACNA "HVAC Duct Construction Standards", latest edition.
3. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
4. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details, and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct unusable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent- enclosure elements of building. Limit clearances to 1/2 inch where furring is shown for enclosure of concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1 inch clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work. Do not locate ductwork over (parallel to) position indicated to extend to deck.

5. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.
6. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus-insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.
7. Provide insulated blank-off plates as indicated on the drawings where ducts connect to vents or louvers.
8. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
9. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards", latest Edition.
10. Do not reroute or shorten branch ductwork to terminal or inline air devices without direct approval of design Engineer. Routings and offsets are designed to be in compliance with cross sectional area and distance from penetration through fire rated wall. Any changes must be in direct compliance with Section 510 of the Standard Mechanical Code, 1991 Edition.

B. Cleaning and Protection
1. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
2. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.02 HIGH PRESSURE DUCTWORK

A. Installation of Ductwork
1. General: Assembly and install ductwork in accordance with recognized industry practices which will achieve air tight (1% leakage) and noiseless (no objectional noise) systems, capable for performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within l/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.
2. Seal ductwork, in accordance with recommendations of SMACNA "HVAC Duct Construction Standards - First Edition", 1985.
3. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
4. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent-enclosure elements of building. Limit clearances to 1/2 inch where furring is shown for enclosure of concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1 inch clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling

and lighting layouts and similar finished work.

5. Electrical Equipment Space: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.
6. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus-insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2 inch.
7. Provide insulated blank-off plates as indicated on the drawings where ducts connect to vents or louvers.
8. Refer to Division 15 - Duct Accessories Section for accessories required in conjunction with high-pressure ductwork. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
9. Support ductwork in manner complying with SMACNA "High Pressure Duct Standards - Latest Edition" hanging and supporting systems chapter.

B. Cleaning and Protection

1. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
2. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

C. Testing for Leakage

1. General: After each duct system is completed, test for duct leakage in accordance with SMACNA "High Pressure Duct Standards - Latest Edition, Chapter 10 - Testing and Leakage". Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.

D. Balancing

1. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Air Duct Accessories for complete Heating, Ventilating, and Air Conditioning Systems.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating, and Air Conditioning Controls.

B. Section 23 0548 – Vibration and Seismic controls for HVAC Piping and Equipment.

C. Section 23 0593 – Testing, Adjusting and Balancing.

D. Section 23 3100 – HVAC Ducts and Casings.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacturer of duct accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) high pressure and low-pressure duct construction standards.

C. Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.

D. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".

E. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 9OA "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data for each type of duct construction; and installation instructions.

B. Shop Drawings: Submit assembly-type shop drawings for each type of duct assembly showing interfacing requirements with ductwork, and method of fastening or support.

C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory include this data in Maintenance Manual.

PART 2 PRODUCTS

2.01 DAMPERS

A. Low Pressure Manual Dampers: Provide dampers of single blade type of multiblade type, constructed in accordance with SMACNA "Low Pressure Duct Standards".

B. Control Dampers: Refer to Division-23 section "Temperature Control Systems" for control dampers; not work of this section.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dampers which may be incorporated in the work include, but are not limited to, the following:
Air Balance, Inc.
Airguide Corp.
Airstream Products Div., Penn Ventilator Co., Inc.
American Warming & Ventilating, Inc.
Arrow Louver and Damper Corp.
Elgo Shutter and Mfg. Co.
Imperial Damper and Louver Co., Inc.
Louvers & Dampers.
Ruskin Mfg. Co.

2.02 FIRE AND SMOKE DAMPERS

A. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11 ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160-165"F (71-74"C) unless otherwise indicated. Provide damper with positive lock in closed position, and with the following additional features:
1. Damper Blade Assembly: Single-blade type (ducts less than 1O inches deep).
2. Damper Blade Assembly: Curtain type.
3. Blade Material: Steel, match casing.

B. Motor Driven Smoke Dampers: Provide smoke damper, resettable type linkage of sizes indicated, designed and constructed in accordance with NFPA-9OA, motor operated, frame constructed of 10-gauge galvanized steel with provisions for securing to building and attaching to ducts, electric motor operator, casing to have a bonded red acrylic enamel finish, low leakage with friction free metal seals, 32" long wire leads for connecting to smoke detector, and the following additional features:
1. Damper Blade Assembly: Single-blade type (ducts less than 1O inches deep).
2. Damper Blade Assembly: Multi-blade type.
3. Blade Material: Steel, matching casing.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire and smoke dampers which may be incorporated in the work include, but are not limited to, the following:
Air Balance, Inc.
Airstream Products Div., Penn Ventilator Co., Inc.
American Warming & Ventilating, Inc.
Arrow Louver and Damper Corp.
Louvers & Dampers.
Phillips-Aire.
Ruskin Mfg. Co.

2.03 TURNING VANES

A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "Low Pressure Duct Standards".

B. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2-inch-wide curved blades set at 1-1/2-inch o.c., supported with bars perpendicular to blades set at 2 inches o.c., and set into side strips suitable for mounting in ductwork, per SMACNA Standards for low pressure duct.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering turning vanes which may be incorporated in the work include, but are not limited to, the following:
Air Filter Corp.
Anemostat Products Div., Dynamics Corp. of America
Duro-Dyne Corp.
Environmental Elements Corp., Subs. Koppers Co., Inc.
Tuttle & Bailey Div. of Interpace Corp.

2.04 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12 inches. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct hardware which may incorporated in the work include, but are not limited to, the following:
Ventfabrics, Inc.
Young Regulator Co.

2.05 DUCT ACCESS DOORS

A. General: Provide, where indicated and at all fire and smoke dampers, duct access doors of size indicated.

B. Construction: Construct of same or greater gage as ductwork served, provide double panel insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with 1 handle-type latch for doors 12 inches high and smaller, 2 handle-type latches for larger doors.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access doors which may be incorporated in the work include, but are not limited to, the following:
Air Balance Inc.
Duro Dyne Corp.
Register & Grille Mfg. Co., Inc.
Ruskin Mfg. Co.
Semco

Ventfabrics, Inc.
Zurn Industries, Inc., Air Systems Div.

2.06 FLEXIBLE CONNECTIONS

A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.07 DUCT ACCESS DOOR/PRESSURE RELIEF DOOR

A. General: Provide a duct access door/pressure relief door in all high-pressure duct immediately downstream of all fire dampers, smoke dampers and fire/smoke dampers.

B. Construction: Factory-fabricated access section, 20-gauge galvanized sheet metal housing welded to round galvanized duct section, gasketed transparent shatterproof cover (inside mounted), pressure sensitive release for manual or emergency vacuum release, pressure " sealed, cover handle and cover retaining chain. Provide double panel pre-insulated if duct is to be insulated.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access doors/pressure relief which may be incorporated in the work include, but are not limited to, the following:
United McGill Corp., TYPE AR-W Access Section
Semco

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which duct accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90-degree elbows in supply.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork, as necessary to interface installation of duct accessories properly with other work.

E. Field Quality Control: Operate installed duct accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

END OF SECTION

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for HVAC Power Ventilators.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating, and Air Conditioning Systems.

B. Section 23 0548 – Vibration and Seismic controls for HVAC Piping and Equipment.

C. Section 23 3100 – HVAC Ducts and Casings.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacturer of power ventilators and exhaust fans, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. AMCA Compliance: Provide power roof ventilators and exhaust fans bearing the Air Movement and Control Association, Inc. (AMCA) Certified Ratings Seal.

C. UL Compliance: Provide power roof ventilator and exhaust fans electrical components which have been listed and labeled by Underwriters Laboratories (UL).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data for power ventilators and exhaust fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.

B. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.

PART 2 PRODUCTS

2.01 ROOF-MOUNTED FANS

A. Uni-Dome exhauster shall be belt drive, centrifugal fan of the size, capacity and electrical characteristics as scheduled on the Drawings.

B. Fan housing and wheel shall be of all aluminum construction. Fan shaft shall be steel.

C. Wheels shall be statically and dynamically balanced.

D. Motor and drive shall be located in an enclosed weatherproof compartment separate from the air stream. Motor and drive shall have permanently lubricated ball bearings rated for

200,000 hours operating life. Drives shall be variable pitch and sized for 165 percent of scheduled motor horsepower.

E. Fan shall be equipped with birdscreen, disconnect switch, internal wiring using "Sealtite" flexible conduit from switch to motor, and gravity backdraft damper.

F. Entire housing shall be factory primed coated to accept field applied finish coat.

G. Provide pre-fabricated roof curb with prime coat finish suitable for field painting, compatible with roof pitch to provide level top.

2.02 APPROVED MANUFACTURERS

A. Roof-Mounted - Exhaust Fan:
1. Greenheck.
2. Cook.
3. Engineer Approved.

PART 3 EXECUTION

3.01 GENERAL

A. Examine areas and conditions under which power ventilators and exhaust fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF POWER VENTILATORS

A. General: Except as otherwise indicated or specified, install ventilators and exhaust fans in accordance with manufacturer's installation instructions and recognized industry practices to ensure that ventilators serve their intended function.

B. Coordinate ventilator and exhaust fan work with work of roofing, walls, and ceilings, as necessary for proper interfacing.

C. Ensure that power ventilators and exhaust fans are wired properly, with correct motor rotation, and positive electrical motor grounding.

D. Remove shipping bolts and temporary supports within ventilators and exhaust fans. Adjust dampers for free operation.

3.03 TESTING

A. General: After installation of ventilators and exhaust fans has been completed, test each to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.04 SPARE PARTS

A. General: Furnish to Owner, with receipt, 1 spare set of belts for each belt drive power ventilator and exhaust fans.

END OF SECTION

SECTION 23 3700
AIR INLETS AND OUTLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Requirements for Air Inlets and Outlets.

1.02 RELATED SECTIONS

A. Section 23 0500 – Common Work Results for Heating, Ventilating, and Air Conditioning System.

B. Section 23 0548 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 0593 – Testing, Adjusting and Balancing.

D. Section 23 3100 – HVAC Ducts and Casings.

1.03 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

C. ARI 650 - Air Outlets and Inlets.

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

E. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Air distribution devices have been specifically selected based on the specified manufacturer's performance data. If the Contractor submits on devices other than those specified, the submittal must include an item-by-item selection of substitutions listed by space location.

C. Where compliance with performance requires different dimensions, such as neck or face size, than the specified item, the submittal must note where these dimension changes occur listing both the original and the new dimensions.

D. Any additional costs by any trade resultant from air device substitution shall be borne by the Contractor.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

A. Submit product data under provisions of Division 01 and Section 23 05 00.

B. Submit schedule of air devices indicating type, size, location, and application.

C. Schedule must include model number, size, air pattern, CFM, pressure drop, throw, NC noise level, finish and mounting method for both the submitted and specified device.

D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

E. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 AIR DEVICES

A. All air devices shall be equal to products scheduled on the Drawings.

2.02 APPROVED MANUFACTURERS

A. Air Devices
   1. Titus.
   2. Price.
   3. Tuttle & Bailey.
   4. Architect Approved.

B. Hooded Intake/Relief Ventilator
   1. Greenheck.
   2. Cook.
   3. Architect Approved.

PART 3 EXECUTION

3.01 INSTALLATION (AIR DEVICES)

A. Install air devices in accordance with manufacturers' instructions.

B. Check location of air devices and make necessary adjustments in position to conform with architectural reflected ceiling plan, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Provide mounting frame or additional ceiling grid tees as required to mount air devices. Support devices as required to prevent ceiling sag.

END OF SECTION

SECTION 23 5100
DOUBLE WALL SPECIAL GAS VENT (CATEGORY IV)

PART 1 GENERAL

1.01 SCOPE

A. This section includes specifications for furnishing and installing Positive Pressure Vent Systems.

1.02 SUBMITTALS

A. Submit the following in accordance with Division 23 Specifications:
   1. Catalog cuts
   2. Sizing calculations
   3. Installation drawings
   4. Installation instructions
   5. Sample of warranty

1.03 QUALITY ASSURANCE

A. APPLICABLE STANDARDS
   1. All products furnished under this Section shall conform to the requirements of the National Fuel Gas Code, NFPA-54, where applicable and shall comply with and be listed to UL1738, Standard for Venting Systems for Gas-Burning Appliances, Category II, III and IV. Components coming in direct contact with products of combustion shall carry the appropriate UL or cUL listing mark or label.

B. WARRANTY
   1. *Limited lifetime Warranty*
      Warranty to guarantee product is free from defects in material and workmanship in normal use for as long as the original consumer owns the system, provided the system has been designed, installed, maintained and used in accordance with manufacturer's specifications.

PART 2 PRODUCTS

2.01 POSITIVE PRESSURE VENT

A. The vent shall be of the double-wall, factory-built type for use on condensing appliances or pressurized venting systems serving Category II, III or IV appliances or as specified by the equipment manufacturer.

B. Maximum temperature shall not exceed 550 °F (288 °C).

C. Vent shall be listed for an internal static pressure of 10" w.g. and tested to 25" w.g.

D. Vent shall be constructed with an inner and outer wall, with a 1" annular insulating airspace. The inner wall (vent) shall be constructed of, 0.015 thick AL29-4C, super ferritic stainless steel. The outer wall (casing) shall be constructed of aluminized steel with .018 of thickness. *Optional: The outer wall shall be constructed of a minimum 0.012 thick Type 430.* Inner and outer walls shall be connected by means of spacer clips that maintain the concentricity of the annular space and allow unobstructed differential

thermal expansion of the inner and outer walls. *All vent parts exposed to the weather shall be stainless steel*.

E. All supports, roof or wall penetrations, terminations, appliance connectors and drain fittings, required to install the vent system shall be included.

F. Roof penetration pieces shall be UL listed and provided by the vent manufacturer. Roof curbs shall be required on roofs greater than 12:12 pitch.

G. Vent shall be secured by sheet metal screws through casings. Joints shall be sealed with factory installed gaskets. Where exposed to weather, the outer closure band shall be sealed to prevent rainwater from entering the space between inner and outer walls.

H. Vent shall terminate in accordance with Installation Instructions and local codes.

2.02 AVAILABLE MANUFACTURERS

A. Corr/Guard Model CG as manufactured by Metal-Fab, Inc.

B. Architect Approved

PART 3 EXECUTION

3.01 Store delivered materials inside, out of the weather. Protect material from accidental damage or vandalism.

3.02 Installation shall conform to the manufacturer's Installation Instructions, UL listing and state or local codes.

3.03 Support vent from building structure using rigid structural shapes for attachment of fixed point supports (plate support assembly). Anchor supports to structure by welding, bolting, steel expansion anchors, or concrete inserts. Size of structural shapes shall be in accordance with manufacturer's recommendations.

3.04 Coordinate installation of dampers or fans. Dampers or fans shall be supported independently form the vent sections. Protect vent from twist or movement due to fan torque or vibration.

3.05 Protect incomplete vent installations by attaching temporary closures over open ends of sections.

3.06 Clean all vent and breechings of dust and debris prior to final connection to appliances.

END OF SECTION

SECTION 23 5216
CONDENSING BOILERS

PART 1 GENERAL

1.01 SCOPE:

A. Work Included: Boiler-Burner units, and related accessories as indicated and required for a complete system. Verify delivery pressure of natural gas furnished by Gas Company and provide additional gas pressure regulator if available delivery pressure does not satisfy pressure requirements of equipment furnished for this project.

1.02 RELATED INFORMATION AND REQUIREMENTS

A. Common Work Results for HVAC - Section 23 05 00

B. Testing and Balancing - Section 23 05 93

1.03 REVIEW OF MATERIALS: Submittal data is required for the following listed materials

A. Boiler-Burner Units

B. The boiler-burner unit shall be manufactured by:
1. Raypack Xfyre.
2. RBI
3. Lochinvar

Note: No other alternate manufacturers will be accepted.

1.04 WARRANTY

A. The equipment manufacturer’s warranty shall be for a period of one year from the date of substantial completion. The warranty shall include parts and labor costs for the repair or replacement of defects in material or workmanship.

PART 2 PRODUCTS

2.01 The boiler shall have a modulating input rating of 500,000 Btu/Hr, an output of 487,500 Btu/Hr and shall be operated on Natural Gas. The boiler shall be capable of full modulation with a turndown ratio of 7:1.

A. The boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The boiler shall have a fully welded, stainless steel, fire tube heat exchanger. Multiple pressure vessels in a single enclosure are not acceptable. There shall be no banding material, bolts, gaskets or "O" rings in the pressure vessel construction. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 2.2 psi at 75 GPM. The condensate collection basin shall be constructed of welded stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

B. The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The boiler shall comply with the energy efficiency requirements of the latest edition of ASHRAE 90.1 and

the minimum efficiency requirements of the latest edition of the AHRI BTS-2000 Standard as defined by the Department of Energy in 10 CFR Part 431. The boiler shall operate at a minimum of 97% Combustion and Thermal Efficiency at full fire as registered with AHRI. The boiler shall be certified for indoor installation.

C. The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided for observing the burner flame and combustion chamber. The burner shall be a premix design constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide smooth operation at all modulating firing rates. The boiler shall be supplied with a negative pressure regulation gas valve and be equipped with a pulse width modulation blower system to precisely control the fuel/air mixture to the burner. The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

D. The boiler shall utilize a 24 VAC control circuit and components. The control system shall have a factory installed display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The boiler shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 50 psi (standard); outlet water temperature sensor with a dual thermistor to verify accuracy; system supply water temperature sensor; outdoor air sensor, flue temperature sensor with dual thermistor to verify accuracy; low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.

E. The boiler shall feature a control system which is standard and factory installed with 128 x 128 resolution display, password security, outdoor air reset, pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities, USB drive for simple uploading of parameters and a PC port connection for connection to a local computer for programming and trending. A secondary operating control that is field mounted outside or inside the appliance is not acceptable. The boiler shall have alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures. The boiler shall have a built-in “Cascade” with leader redundancy to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal “Cascade” function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The boiler shall be capable of remote communication via optional Remote Connectivity with the capability of historical trending and sending text message or email alerts to notify the caretaker of a boiler alarm and remote programming of onboard boiler control. The boiler shall be capable of controlling an isolation valve (offered by manufacturer) during heating operation and rotation of open valves in standby operation for full flow applications. The control must have optional capability to communicate via Modbus protocol with a minimum of 46 readable points. The boiler shall have an optional gateway device which will allow integration with LON or BacNet protocols.

F. The control system shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation. A 0-10 VDC output signal shall control a variable speed boiler pump (offered by manufacturer) to keep a fixed Delta T across the boiler regardless of the modulation rate. The boiler shall have the capability to receive a 0-10 VDC input signal from a variable speed system pump to anticipate changes in

system heat load in order to prevent flow related issues such as erratic temperature cycling.

G. The Boiler shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 46 connection points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts, Louver Proving Switch, Tank Thermostat, Domestic Hot Water Building Recirculation Pump Contacts, Domestic Hot Water Building Recirculation Temperature Sensor Contacts, Remote Enable/Disable, System Supply Temperature Sensor, Outdoor Temperature Sensor, Tank Temperature Sensor, Modbus Building Management System Signal and Cascade Control Circuit. A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 120 volt / 60 hertz / single phase on all models. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump.

H. The boiler shall be installed and vented with a direct vent system with vertical roof top termination of both the exhaust vent and combustion air. The flue shall be Category IV approved material constructed of PVC and CPVC. A separate pipe shall supply combustion air directly to the boiler from the outside. The boiler's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet. The air inlet must terminate on the rooftop with the exhaust.

I. The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NOx) to meet the requirements of South Coast Air Quality Management District in Southern California and the requirements of Texas Commission on Environmental Quality. The manufacturer shall verify proper operation of the burner, all controls and the integrity of the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

J. The boiler shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments. The boiler shall be certified for operation at elevations of 4,500 feet, and above, by a 3rd party organization.

K. The boiler shall be suitable for use with polypropylene glycol up to a 50% concentration. The de-rate associated with the glycol will vary per glycol manufacturer.

STANDARD CONSTRUCTION

The boiler shall be constructed in accordance with the following code requirements as standard equipment. Manufacturing of special models to meet the below code requirements is not acceptable.

California Code
Massachusetts Code
Kentucky Code
CRN Approval in Canada

Note: Due to the large disparity in CSD-1 interpretation from state to state, please confirm to the factory all controls required in your jurisdiction.

PART 3 EXECUTION

3.01 SPACE CONDITIONS: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.

3.02 INSTALLATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.

B. Install the work of this section in strict accordance with the approved design drawings and the requirements of the contract.

C. Follow manufacturer's instructions in the delivery, storage, handling and installation of all equipment, accessories and connections.

3.03 TESTING AND ACCEPTANCE

A. Upon completion of the installation, provide the services of factory authorized personnel to verify that the installation meets the specifications, the manufacturer’s written instructions and all state and local codes and to perform startup and initial adjustment of the boiler, burner and controls in accordance with the manufacturer’s written instructions.

B. Where inspections or tests show materials or workmanship are deficient, replace or repair as necessary, and repeat the inspection or test until the specified standards are achieved.

3.04 INSTRUCTIONS AND VERIFICATION

A. Furnish of Owners manuals, which include instructions for installation, operation and maintenance of the boiler(s) as specified in 23 05 00.

B. Document the results of the startup and initial adjustment on the manufacturer’s startup record and complete the manufacturer’s CSD-1 verification form. Submit the startup record and CSD-1 form to the Engineer.

END OF SECTION

SECTION 23 52 33
HEAT GENERATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes packaged, factory-fabricated and assembled, gas-fired, fire-tube condensing boilers, trim, and accessories for space heating hot water.

1.03 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Source quality-control test reports: Indicate and interpret test results for compliance with performance requirements before shipping.

D. Field quality-control test reports: Indicate and interpret test results for compliance with performance requirements.

E. Warranty: Standard warranty specified in this Section.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil-Fired Boilers - Minimum Efficiency Requirements."

D. AHRI Compliance: Boilers shall be AHRI listed and must meet the minimum efficiency specified under AHRI BTS-2000 as defined by Department of Energy in 10 CFR Part 431.

E. ANSI Compliance: Boilers shall be compliant with ANSI Z21.13 test standards for US and Canada.

F. CSA Compliant: Boilers shall be compliant with CSA certification.

1.06 COORDINATION

A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.07 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Fire-Tube Condensing Boilers:
      a. Heat Exchanger, Pressure Vessel and Condensation Collection Basin shall carry a 10-year limited warranty against defects in materials or workmanship and failure due to thermal shock.
      b. All other components shall carry a one-year warranty from date of boiler start up.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lochinvar Knight FTXL

B. Patterson-Kelley

C. LAARS

D. Architect Approved

2.02 CONSTRUCTION

A. Description: Boiler shall be natural gas fired, fully condensing, and fire tube design. The boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

B. Heat Exchanger: The heater exchanger shall bear the ASME “H” stamp for 160 psi working pressure and shall be National Board listed. The heat exchanger shall be constructed of a fully welded stainless steel and of fire tube design. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Cast iron, aluminum, or condensing copper tube boilers will not be accepted.

C. Efficiency: Boilers shall have an AHRI certified minimum thermal efficiency of 97 percent.

D. Condensate Collection Basin: Fully welded stainless steel and shall include a stainless-steel combustion analyzer test port.

E. Pressure Vessel: The pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The pressure vessel shall be designed for a single-pass water flow to limit the water side pressure drop.

F. Burner: Natural gas, forced draft single burner premix design. The burner shall be high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The burner shall be capable of the stated gas train turndown without loss of combustion efficiency.

G. Blower: Boiler shall be equipped with a pulse width modulating blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The burner firing sequence of operation shall include pre-purge, firing, modulation, and post-purge operation.
1. Motors: Comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

H. Gas Train: The boiler shall be supplied with a negative pressure regulation gas train and shall be capable of the following minimum turndowns:

Model	Turndown	Minimum Input	Maximum Input
FTX725	7:1	103,500	725,000

I. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

J. High Altitude: Boiler shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments. High altitude operation shall be certified at a minimum of 4,500 feet above sea level by a third-party organization. High altitude boilers shall be certified to 3,000 to 12,000 feet above sea level. The boilers shall carry a CSA certification for high altitude operation up to 12,000 feet.

K. Casing:
1. Jacket: Heavy gauge primed and painted steel jacket with snap-in closures.
2. Control Compartment Enclosures: NEMA 250, Type 1A.
3. Insulation: Minimum ½ inch thick, mineral fiber insulation surrounding the heat exchanger.
4. Combustion-Air Connections: Inlet and vent duct collars.

L. Characteristics and Capacities:
1. Heating Medium: Hot water.
2. Design Water Pressure Rating: 160 psi working pressure.
3. Safety Relief Valve Setting: 50 psig
4. Minimum Water Flow Rate:

Model	Minimum Flow
FTX725	20 gpm

2.03 TRIM

A. Safety Relief Valve:
1. Size and Capacity: 50 lb.
2. Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

B. Pressure Gage: Minimum 3-1/2-inch diameter. Gauge shall have normal operating pressure about 50 percent of full range.

C. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.

D. Condensate Neutralization Kit: Factory supplied condensate trap with condensate trip sensor, high-capacity condensate receiver prefilled with appropriate medium.

2.04 CONTROLS

A. Refer to Division 23 Section "Instrumentation and Control for HVAC."

B. Boiler controls shall feature a standard, factory installed multi-color graphic LCD screen display with navigation dial and includes the following standard features:

1. Con-X-Us capable: Boiler shall have the ability to communicate remotely using the optional Con-X-Us software via a wireless or Ethernet connection.
2. Variable Speed Boiler Pump Control: Boiler may be programmed to send a 0-10V DC output signal to an ECM or VFD boiler pump to maintain a designed temperature rise across the heat exchanger. The boiler shall be able to operate in this mode with a minimum temperature rise of 20 degrees F and a maximum temperature rise of 60 degrees F. Project specific temperature rise shall be 40 degrees.
3. Password Security: Boiler shall have a different password security code for the User and the Installer to access adjustable parameters.
4. Outdoor air reset: Boiler shall calculate the set point using a field installed, factory supplied outdoor sensor and an adjustable reset curve.
5. Pump exercise: Boiler shall energize any pump it controls for an adjustable time if the associated pump has been off for a time period of 24 hours.
6. Four pump control: Boiler shall have the ability to control the boiler pump, a system pump, a domestic hot water pump, and a domestic hot water recirculation pump.
7. Ramp delay: Boiler may be programmed to limit the firing rate based on six limits steps and six-time intervals.
8. Boost function: Boiler may be programmed to automatically increase the set point a fixed number of degrees (adjustable by installer) if the setpoint has been continuously active for a set period of time (time adjustable by installer). This process will continue until the space heating demand ends.
9. Domestic hot water priority: Boiler shall make the domestic hot water call for heat a priority over any space heating call and adjust the boiler setpoint to the domestic hot water boiler setpoint.
10. Domestic hot water modulation limiting: Boiler may be programmed to limit the maximum domestic hot water firing rate to match the input rating of the indirect tank coil.
11. Domestic hot water night setback: Boiler may be programmed to reduce the domestic hot water tank set point during a certain time of the day.
12. PC port connection: Boiler shall have a PC port allowing the connection of PC boiler software.
13. Time clock: Boiler shall have an internal time clock with the ability to time and date stamp lock-out codes and maintain records of runtime.
14. Maintenance reminder: Boiler shall have the ability to display a yellow colored, customizable maintenance notification screen. All notifications are adjustable by the installer based upon months of installation, hours of operation, and number of boiler cycles.
15. English Error codes: Boiler shall have a user interface that displays a red error screen with fault codes that are displayed in English and include a date and time stamp for ease of servicing.
16. Anti-cycling control: Boiler shall have the ability to set a time delay after a heating demand is satisfied allowing the boiler to block a new call for heat. The boiler will display an anti-cycling blocking on the screen until the time has elapsed or the water temperature drops below the anti-cycling

differential parameter. The anti-cycling control parameter is adjustable by the installer.

17. Space Heating Night setback: Boiler may be programmed to reduce the space heating temperature set point during a certain time of the day.
18. Freeze protection: Boiler shall turn on the boiler and system pumps when the boiler water temperature falls below 45 degrees. When the boiler water temperature falls below 37 degrees the boiler will automatically turn on. Boiler and pumps will turn off when the boiler water temperature rises above 43 degrees.
19. Isolation valve control: Boiler shall have the ability to control a 2-way motorized control valve. Boiler shall also be able to force a fixed number of valves to always be energized regardless of the number of boilers that are firing.
20. BMS integration with 0-10V DC input: The Control shall allow an option to Enable and control set point temperature or control firing rate by sending the boiler a 0-10V input signal.
21. Data logging: Boiler shall have non-volatile data logging memory including last 10 lockouts, space heat run hours, domestic hot water run hours and ignition attempts. All data should be visible on the boiler screen.

C. The boiler shall have a built in Cascade controller to sequence and rotate lead boiler to ensure equal runtime while maintaining modulation of up to 8 boilers of different btu inputs without utilization of an external controller. The factory-installed internal cascade controller shall include:

1. Lead lag: The Control module shall allow only one boiler to fire at the beginning of a call for heat. Once the lead boiler is in full fire and the control calculates that additional heat is required it will call on an additional boiler as needed.
2. Efficiency optimization: The Control module shall allow multiple boilers to simultaneously fire at minimum firing rate in lieu of Lead/Lag.
3. Front end loading: The Control module shall allow the cascading and functional control of several non-condensing Lochinvar products alongside the Knight FTXL.
4. Rotation of lead boiler: The Control module shall change the lead boiler every hour for the first 24 hours after initializing the Cascade. Following that, the leader will be changed once every 24 hours.

D. Boiler operating controls shall include the following devices and features:

1. Set-Point Adjust: Set points shall be fully adjustable by the installer.
2. Sequence of Operation: Factory installed controller to modulate burner firing rate to maintain system water temperature in response to call for heat.
3. Sequence of Operation: Boiler shall come standard with outdoor reset control which will control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 10 deg F outside-air temperature, set supply-water temperature at 180 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 140 deg F.

E. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation and include:

1. High Temperature Limit: Automatic and manual reset stops burner if operating conditions rise above maximum boiler design temperature. Limit switch to be manually reset on the control interface.
2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manually reset on the control interface.
3. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.

4. High and Low Gas Pressure Switches: Pressure switches shall prevent burner operation on low or high gas pressure. Pressure switches to be manually reset on the control interface.
5. Blocked Drain Switch: Blocked drain switch shall prevent burner operation when tripped. Switch to be manually reset on the control interface.
6. Low air pressure switch: Pressure switches shall prevent burner operation on low air pressure. Switch to be manually reset on the control interface.
7. Optional Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for any lockout conditions.

F. Building Automation System Interface:
1. Boiler shall have the ability to receive a 0-10V system from a building management system and control by the following:
   a. 0-10V DC input to control Modulation or Setpoint
   b. 0-10V DC input from Variable speed Boiler pump
   c. 0-10V DC output signal to a Variable speed system pump
   d. 0-10V DC input Enable/Disable signal
2. Factory installed Modbus gateway interface to enable building automation system to monitor, control, and display boiler status and alarms.

2.05 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

C. Electrical Characteristics:
1. See Drawings
2. Voltage
   a. 120V / 1PH
3. Frequency: 60 Hz

2.06 VENTING

A. Exhaust flue must be Category IV approved PVC, CPVC, PP or stainless-steel sealed vent material from one of the approved manufacturers listed in the Installation and Operation manual. Boilers exhaust vent length must be able to extend to 100 equivalent feet.

B. Intake piping must be of approved material as listed in the Installation and Operations manual. Boilers intake pipe length must be able to extend to 100 equivalent feet.

C. Boiler venting and intake piping configuration shall be installed per one of the approved venting methods shown in the Installation and Operation manual.

D. Boilers using common venting must only include like models and the optional common vent damper. Contact the factory for common vent sizing.

E. Boiler shall come standard with a flue sensor to monitor and display flue gas temperature on factory provided LCD display.

F. Refer to manufacturer's Installation and Operations manual for detailed venting instructions and approved manufacturers.

2.07 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
   1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in of piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 BOILER INSTALLATION

A. Install equipment on 4" concrete housekeeping pad.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.03 CONNECTIONS

A. Install boilers level on concrete bases. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of equipment connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Boiler Venting:
1. Install flue venting kit and combustion-air intake.
2. Connect full size to boiler connections. Comply with requirements in Division 23 Section “Breechings, Chimneys, and Stacks.

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
1. Perform installation and startup checks according to manufacturer's written instructions. Complete startup form included with Boiler and return to Manufacturer as described in the instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.05 DEMONSTRATION

A. Engage a factory representative or a factory-authorized service representative for boiler startup. Start-up sheet shall be completed and a copy shall be sent to the Engineer and the Manufacturer. A combustion analysis shall be completed and the gas valve adjusted per the Installation and Operations manual and note in start-up report.

B. Factory representative or a factory-authorized representative shall provide Owner’s training to instruct maintenance personnel to adjust, operate, and maintain boilers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 6213
AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-to-air outdoor condensing unit.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.02 RELATED SECTIONS

A. Section 23 0923 – Automatic Temperature Controls.

B. Section 23 2300 – Refrigerant and Condensate Piping.

C. Section 23 3100 – HVAC Ducts and Casings.

1.03 REFERENCES

A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE 90.1 - Energy Conservation in new Building Design.

C. ANSI/UL 303 - Refrigeration and Air-Conditioning Condensing, and Air-Source Heat Pump Equipment.

D. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

E. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

F. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.

G. ANSI/UL 465/559 - Central Cooling Air Conditioners and Heat Pumps

1.04 SUBMITTALS

A. Submit drawings indicating components, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

B. Submit product data indicating rated capacities, weight specialties and accessories, electrical nameplate data, and wiring diagrams.

C. Submit design data indicating pipe and equipment sizing.

D. Submit manufacturer's installation instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, start-up instructions, installation instructions, and maintenance procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage. Protect coils.

1.07 WARRANTY

A. Provide five (5) year parts and replacement warranty on the compressors and heat exchangers. In addition, the entire unit, excluding refrigerant, will have a 12-month parts and labor warranty from date of substantial Completion.

B. The contractor shall warranty all material and workmanship to be free from defects for a period of one (1) year from the date of substantial completion.

PART 2 PRODUCTS

2.01 SUMMARY

A. The contractor shall furnish and install air-to-air outdoor condensing units as shown as scheduled on the contract documents. The units shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS
1. York.
2. Johnson Controls.
3. Architect Approved.

2.02 GENERAL UNIT DESCRIPTION

A. Provide self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, multi-stage compressor(s), condensing coil and fan(s), integral sub-cooling circuit(s), filter drier(s), and controls.

B. Construction and Ratings: In accordance with ARI 210/240,and ANSI/UL 303 and ANSI/UL 465/559. Testing shall be in accordance with ASHRAE 14.

C. Performance Ratings: Energy Efficiency Rating (EER) not less than prescribed by ANSI/ASHRAE 90A.

2.03 CASING

A. House components in heavy gauge galvanized steel cabinet with grille-style sound control top design. Unit's surface shall be tested 500 hours in salt spray test.

B. Mount controls in weatherproof panel provided with removable panels and/or access doors with quick opening fasteners. Controls shall have single panel access with space provided for field installed accessories.

2.04 CONDENSER COILS

A. Coils: Continuous aluminum fins bonded to seamless 3/8" minimum aluminum tubing. Provide sub-cooling circuit(s). Seal with holding charge of refrigerant.

B. Coil Guard: Steel louver coil guard.

2.05 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Fans shall be statically and dynamically balanced.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phases with permanent lubricated ball bearings or sleeve bearing and built in current and thermal overload protection.

2.06 COMPRESSORS

A. Provide energy efficient, hermetic scroll compressors. Provide suction gas cooled motor with over temperature and over current protection. Provide external high- and low-pressure cutout devices. Reciprocating compressors are not acceptable.

B. Provide each unit with one refrigerant circuit factory supplied with filter drier, suction and liquid line service valves, and piped.

2.07 CONTROLS

A. Provide factory wired condensing units with 24-volt control circuit with internal fusing and control transformers, contactor pressure lugs and/or terminal block for power wiring. Contractor to provide field installed unit mounted disconnect switch. Units shall have single point power connections.

B. Provide the following optional operating controls:
   1. Provide either a five or seven minute off timer preventing compressor from short cycling.
   2. Provide controls to permit operation down to either 55degrees F outdoor ambient temperature
   3. Provide a four-minute time delay relay to sequence the starting of compressors.

C. Provide programmable electronic microcomputer-based room thermostat, located as indicated.

D. Room thermostat shall incorporate:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from set point.
   3. Set-up for four separate temperatures per day.

4. Instant override of set-point for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. Programming based on weekdays, Saturday and Sunday.
7. Switch selection features including imperial or metric display, 12- or 24-hour clock, keyboard disable, remote sensor, fan on-auto.

E. Room thermostat display shall include:
1. Time of Day.
2. Actual room temperature.
3. Programmed temperature.
4. Programmed time.
5. Duration of timed override.
6. Day of week.
7. System mode indication: Heating, cooling, auto, off, fan auto, fan on.
8. Stage (heating or cooling) operation.

2.08 MISCELANEOUS FEATURES

A. Neoprene Isolators: Provide field installed rubber- in-shear isolators.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units on vibration isolation.

D. Install units on roof supports or equipment pads as indicated.

E. Provide connection to refrigeration piping system and evaporators.

F. Install thermostat wire in conduit from exterior wall to condensing unit. Route with refrigerant piping.

3.02 MANUFACTURER'S FIELD SERVICES

A. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION

SECTION 23 7413
PACKAGED HVAC UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Variable Volume Packaged Air Handling Units.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0713 - Duct Insulation for HVAC.

C. Section 23 3100 - HVAC Ducts and Casings.

D. Section 23 0923 – Automatic Temperature Control.

E. Division 23 – All sections.

1.03 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 - Standards Handbook.

D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

E. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

F. NFPA 70 - National Electrical Code.

1.04 QUALITY ASSURANCE

A. Unit performance shall be certified in accordance with ARI 430 for Central Station air handling units.

B. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

C. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

D. Product Options: Drawings must indicate size, profiles and dimensional requirements of unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".

E. End of line test with full report available upon request.

F. Certifications
   1. Entire unit shall be ETL Certified per U.L. 60335-2-40 and bear an ETL sticker.
   2. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05.
   3. Indirect gas-fired furnace shall be ETL Certified as a component of the ERU. Indirect

gas-fired furnace shall be an ETL Recognized Component of the ERU per ANSI Z83.8.

1.05 SUBMITTALS

A. Submit under provisions of Section 23 0500.

B. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

C. Product Data:
1. Provide literature, which indicates dimensions, weights, capacities, ratings, fan performance, gages and finishes of materials, and electrical characteristics and connection requirements.
2. Provide fan curves with specified operating point clearly plotted.
3 Submit sound power level data for both fan outlet and casing radiation at rated capacity.
4. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

D. Manufacturer's Installation Instructions.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 23 0500.

B. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 0500.

B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test-run under observation.

1.09 EXTRA MATERIALS

A. Provide one set of fan belts for each unit.

B. Provide one set of spare filters for each unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck.

B. Architect Approved.

2.02 GENERAL DESCRIPTION

A. Furnish as shown on plans. Unit performance and electrical characteristics shall be per the job schedule.

B. Configuration: Fabricate as detailed on prints and drawings.

C. The complete unit shall be ETL/UL listed.

D. The unit shall be ASHRAE 90.1-2016 compliant and labeled.

E. Each unit shall be specifically designed for outdoor application and include a weatherproof cabinet. Units shall be of a modular design with factory installed access sections available to provide maximum design flexibility.

F. Units shall be shipped fully charged with R410A.

G. Factory test shall include test and adjustment of the gas furnace.

H. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.

I. Performance: All scheduled capacities and face areas are the minimum accepted value. All scheduled amps, KW, and HP are maximum accepted values that allow scheduled capacity to be met.

2.03 MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with 2" aluminum mesh filter assembly, evaporator coil, hot gas reheat coil, indirect gas-fired furnace, packaged DX system, phase and brownout protection, motorized dampers, filter assembly intake air, supply air blower assembly, seismic curb assembly, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power which have dual point power.

2.04 CABINET

A. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   1. Unit’s exterior shall be supplied from the manufacturer using G60 galvanneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 7023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours. Uncoated galvanized steel exterior is not acceptable.
   2. Internal assemblies: 22 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   1. Materials: Rigid urethane injected foam. Foam board not acceptable.
      a. Thickness: 2 inch (50.8 mm)
      b. Thermal Resistance R13
      c. Thermally broken

d. Meets UL94HF-1 flame requirements.
e. Location and application: Full coverage of entire cabinet exterior to include walls, roof of unit, unit base, and doors.

2. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
   a. Thickness: 2 inch (50.8 mm)
   b. Thermal Resistance R8
   c. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
   d. Location and application: Divider panels between outdoor air and return air/exhaust air streams.

C. Roof Insulation: 2-inch (50.8 mm) fiberglass located above the 1-inch (25.4 mm) foam panel.

D. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18-gauge galvanized G90 steel or painted galvannealed steel.

E. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125-inch-thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

F. Evaporator Coil: Evaporator coil shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.

G. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. Unit shall be equipped with a Unit Disconnect Switch.

H. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

I. P-trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.

J. Reheat coil shall be an all-aluminum micro channel design with factory installed modulating hot gas reheat valve.

K. Indirect gas furnace
1. Shall be ETL Certified as a component of the unit.
2. Shall have an integral combustion gas blower.
3. Shall be ETL Certified for installation downstream of a cooling coil.
4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
5. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. . Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.

6. Heat exchanger shall have a 25-year extended warranty.
7. Furnace control shall be HighTurndown 16:1 Modulating.
8. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower.
9. Shall have solid state controls permitting stand-alone operation or control by building controllers.

L. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils shall be all-aluminum micro channel design appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the unit's exterior. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. The lead refrigerant compressor shall be inverter hermetic scroll-type. Additional compressor shall be single stage hermetic scroll-type paired in tandem with lead inverter compressor. Compressors shall be equipped with liquid line filter drier, electronic expansion valves (EEV) or thermostatic expansion valves (TXV) on non-inverter compressor circuits, manual reset high pressure and low-pressure cutouts and all appurtenant sensors, service ports, leak detection sensors and safety devices. Compressed refrigerant system shall be fully charged with R-454B refrigerant. Compressors shall be mounted within an insulated access compartment and on a raised cabinet shelf to reduce sound and vibration. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

M. Condenser Fans: Fan blades must be constructed of aluminum or a composite material and have a geometry designed and documented to reduce sound and energy when compared to a traditional rectangular blade fan. Traditional rectangular blade fans are not allowed due to increased noise generated and increase power utilized. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. Single condenser fan running at max RPM and design static pressure shall not exceed an A-weighted sound power level of 75 db at free inlet/outlet test conditions.

N. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
1. Global alarm condition (active when there is at least one alarm)
2. Supply Air Proving alarm
3. Dirty Filter Alarm
4. Compressor Trip alarm
5. Compressor Locked Out alarm
6. Supply Air Temperature Low Limit alarm
    a. Sensor #1 Out of Range (outside air temperature)
    b. Sensor #2 Out of Range (supply air temperature)
    c. Sensor #3 Out of Range (cold coil leaving air temperature)

O. Phase and brownout protection: Unit shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.

P. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.

Q. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.

R. Provide unit with vertical downflow supply air ductwork connection.

S. Curb Assembly: A curb assembly made of 14-gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 14 in. Roof curb shall be seismic rated.

T. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A / E. Service outlet requires a dedicated single phase electric circuit. Unit contains a 120 VAC transformer to provide power to service outlet.

U. 24V/120V Smoke detector: Duct smoke detector is shipped loose for field mounting and wiring in the supply or return air duct. The air duct smoke detector housing shall be UL listed per UL 268A specifically for use in air handling systems. The air duct smoke detector housing shall be suitable for mounting indoors. The detector shall operate at air velocities of 100 feet per minute to 4000 feet per minute (0.5 to 20.32 meters/second). The power supply voltage shall be 20-29 VDC, 24 VAC 50-60 Hz, and 120 VAC 50-60 Hz. The detector shall consist of an alarm initiation contact and two DPDT auxiliary contact closures. WARNING: Duct smoke detectors are NOT a substitute for open area smoke detectors; NOT a substitute for early warning detection; NOT a replacement for a building's regular fire detection system. Refer to NFPA 72 and 90A for additional information.

V. UV Lights: UV-C lights are factory-mounted and access door kill switches are included.

2.05 BLOWER

A. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14-gauge galvanized steel platform and shall be equipped with 1.125-inch-thick neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with aluminum wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities.

D. Blades: Welded aluminum blades only.

E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.06 MOTORS

A. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

B. Motors shall be 60 cycle, 3 phase 208 volts.

2.07 UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons. DDC controller shall be BACNet MSTP.

C. Unit supply fan shall be configured for constant volume (on-off).

D. Outside Air damper control shall be two-position.

E. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply air blower assembly. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

F. Airflow monitoring required in the supply airstream(s).

2.08 FILTERS

A. Unit shall have permanent 2-inch (50.8 mm) aluminum filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply air stream. MERV 13 disposable pleated filters shall be provided in the supply final air stream.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.03 CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

B. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.

C. Duct installation and connection requirements are specified in Division 23 of this document.

E. Electrical installation requirements are specified in Division 26 of this document.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.05 START-UP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.06 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

3.07 WARRANTY

A. Provide unit with minimum one (1) year factory parts and labor warranty from date of equipment start-up.

B. Provide refrigerant compressors with minimum five (5) year factory warranty.

END OF SECTION

SECTION 23 8101
TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic requirements for heat transfer units.

1.02 RELATED SECTIONS

A. Automatic Temperature Controls - Section 23 09 23.

B. Equipment Wiring Systems: Division 26.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 and Section 23 05 00.

B. Submit manufacturer's installation instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01.

B. Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 23 05 00.

B. Store and protect products under provisions of Section 23 05 00.

C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

PART 2 PRODUCTS

2.01 UNIT HEATERS

A. **CABINET**: Cabinet shall be fabricated of die formed heavy gauge welded steel and finished with durable powder coated paint. An internal shroud is provided around the heating element to ensure uniform airflow delivery across the entire face of heating elements. The enclosed motor and fan are isolated to minimize vibration noise level. The control compartment is provided with a hinged and latched access door for easy installation and maintenance.

B. **ELEMENTS**: Elements are all steel tubes with highest quality Nickel-Chromium resistance wire embedded in compacted efficient dielectric to ensure proper heat transfer. Steel helical fins are machine crimped and brazed to steel tube for effective transfer of heat.

C. **MOTOR**: Motors shall be totally enclosed; all angle industrial rated. Motor is single phase with voltage rating same as heater primary voltage. Single speed permanently lubricated thermally protected motors with unit bearings on 3-10 KW units. Two speed thermally protected motors with sleeve bearings on 12.5 – 48 KW units. Sleeve bearing motors are lubricated for 5-years continuous or 10-year intermittent use.

D. **WIRING**: Heaters shall be designed for a single circuit with elements, motor and control circuits wired in accordance with the latest national electric code or applicable local codes and ETL listed complying with UL Standard 2021. All three-phase heaters shall have balanced equal phases.

E. **LIMIT CONTROLS**: All units shall have built in automatic reset thermal cutouts to shut down motor and elements if safe operating temperatures are exceeded. Fan purge to dissipate residual heat from elements on heater shut down is a factory-installed option.

F. **CONTROLS**: Contactors and control circuit transformers, where required, are factory installed and wired. Single stage control on 3-20 KW units. 25 KW through 48 KW unit can be operated as 2-stage. Control options (field installed).
Thermostat – wall mounted.

G. **MOUNTING**: Unit heaters can be mounted with the motor shaft from horizontal to downward at 45° off horizontal. Pre-drilled holes and installed threaded nuts provided to allow hanging by threaded rods – ¼" for units up to 15 KW and 5/16" for 20 KW units and larger. Optional wall / ceiling mounting brackets are available for all units. The louver assembly can be rotated 90 degrees to direct airflow in any direction.

2.02 MANUFACTURERS

A. Unit Heaters:
1. Markel.
2 Q-Mark.
3. Architect Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

C. Protect units with protective covers during balance of construction.

3.03 CLEANING

A. Clean work under provisions Division 1.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 23 8219
TERMINAL HEAT TRANSFER UNITS -FAN/BLOWER COIL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fan Coil Units.

B. Blower Coil Units.

1.02 RELATED SECTIONS

A. Direct Digital Control System for HVAC – Section 23 0923.

B. Hydronic Piping - Section 23 2113.

C. Hydronic Specialties - Section 23 2114.

D. Equipment Wiring Systems: Electrical supply to units - Division 26.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data for fan coil units, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished and installation instructions.

B. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

PART 2 PRODUCTS

2.01 FAN COIL UNITS

A. Configuration:
   1. General:
      a. Factory assembled Hi-Performance horizontal and vertical fan coil units complete with coil, fan, motor, drain pan, and all required wiring, piping and controls.
      b. Cabinet shall be made of heavy 18-gauge galvanized steel.
      c. The interior surfaces shall be lined with 1/2″ thick standard fiberglass insulation. Insulation and adhesive shall meet NFPA-90A requirements for flame spread and smoke generation.
      d. Adhesive shall be certified according to the GREENGUARD Indoor Air Quality (IAQ) Certification for Low Emitting Products. Reference Standard:

GGPS.001 GREENGUARD IAQ Standard for Building Materials, Finishes, and Furnishings. Reference Standard: GGPS.002 GREENGUARD Children and SchoolsSM Standard.

e. Units shall have a stainless-steel drain pan extending the entire width of the coil with “telltale” second drain connection. Drain pan shall comply with ASHRAE 62.1-2019.

f. Stainless steel pans shall be externally coated with 2-part closed cell foam insulation.

2. HPY Horizontal Hideaway with Plenum Units:

a. Units shall be supplied with a collar for supply duct connection.

b. A heavy gauge steel plenum shall enclose the blower/motor assembly with bottom or rear return as indicated on the plans.

c. Units shall have pleated MERV 8 filter.

d. Unit shall have front supply/rear return, bottom filter access.

B. Certification:

1. Safety Agency:
Units shall be listed by ETL indicating the units comply with the minimum requirements of the U.S. and Canadian national product safety standard, ANSI/UL Standard 1995, and with CAN/CSA C22.2 No. 236.

2. Capacities:
Fan coil capacities are certified and listed in accordance with AHRI Standard 440-2019.

C. Materials:

1. Coils:

a. All coils shall have 1/2″ copper tubes, and aluminum fins, galvanized end sheet 10 fins per inch spacing, galvanized end sheets. Coil fins shall be mechanically bonded to copper tubes.

b. Copper tubes must comply with ASTM B-75.

c. Fin thickness shall be 0.0045″.

d. Tube thickness shall be 0.016″.

e. Coil rows shall be as indicated on the drawings.

2. Valves:

a. For installation in a 4-pipe system, unit shall be equipped with:

1) Valve size shall be as shown on the drawings.

2) 4 manual ball valves for service.

3) 2 motorized control valve, 300 psig service.

a) Primary - 35 psid proportional with quick-release actuator.

b) Secondary - 35 psid proportional with quick-release actuator.

b. Valve package shall be equipped with specialty devices as indicated on the drawings.

1) Coil connections – unions at the coil.

2) Flow Controls:

a) Primary - Return fixed flow control shall be specified on the equipment schedule.

b) Secondary - Return fixed flow control shall be specified on the equipment schedule.

3) Service Fittings:

a) Primary - Supply P-T port.

b) Secondary - Supply P-T port.

4) Strainer:

a) Primary - Y-Strainer with blowdown.
b) Secondary - Y-Strainer with blowdown.

3. Fans:
   a. Fans shall be direct-drive, double-width fan wheels with forward-curved blades.
   b. Blower wheels shall be statically and dynamically balanced.
   c. Scrolls and fan wheels shall be constructed of galvanized steel.
   d. Shall be easily removable.
4. Motors:
   a. Motors shall be 3-speed, single phase, 60 Hz constant-torque ECM motors with means for potentiometer field adjustment of each speed.
   b. Motors shall be connected with quick connect electrical plugs.
   c. Motors shall have internal thermal overload protection with automatic reset.
5. Controls:
   a. Controls Voltage:
      1) Unit shall be equipped with 24VAC control.
   b. Control Package shall be equipped with specialty devices listed below:
      1) 24VAC condensate overflow switch.
      2) Controls by DDC Contractor.
6. Operating Characteristics:
   a. A 4-pipe system shall be capable of providing heating and cooling on demand.
7. Electrical Requirements:
   a. Standard unit shall operate on 115 volts, single phase, 60 Hz electrical power.
8. Options and Accessories:
   a. Service switch with lock-out & tag-out features shall be factory installed. Circuit shall be non-fused.
9. Inlet plenums shall be constructed of 18-guage galvanized steel. The inlet plenum shall enclose the motor and fan and include a filter rack.

2.02 FAN COIL UNITS

A. Configuration
   1. General:
      a. Factory assembled horizontal fan coil units complete with coil, fan, motor, drain pan, and all required wiring, piping and controls.
      b. Cabinet shall be made of heavy 18-gauge galvanized steel.
      c. The interior surfaces shall be lined with 1/2″ thick standard fiberglass insulation. Insulation and adhesive shall meet NFPA-90A requirements for flame spread and smoke generation.
      d. Adhesive shall be certified according to the GREENGUARD Indoor Air Quality (IAQ) Certification for Low Emitting Products. Reference Standard: GGPS.001 GREENGUARD IAQ Standard for Building Materials, Finishes, and Furnishings. Reference Standard: GGPS.002 GREENGUARD Children and Schools℠ Standard.
      e. Units shall have a removable stainless steel drain pan extending the entire width of the coil. Drain pan shall comply with ASHRAE 62.1-2019.
      f. Stainless steel pans shall be externally coated with 2-part closed cell foam insulation.
   2. CPY, Horizontal Hideaway with Plenum Units:
      a. Units shall be supplied with a collar for supply duct connection.
      b. A heavy gauge steel plenum shall enclose the blower/motor assembly with

bottom or rear return as indicated on the plans.

c. Units shall have a pleated MERV 8 filter.

d. Unit shall have front supply/rear return.

3. CXB Horizontal Cabinet Units:

a. The unit shall have a stamped discharge grille.

b. Units shall have removable bottom access panel with stamped return air grille and filter rack.

c. Units shall have pleated MERV 8 filter.

d. Cabinet shall be painted with a Bright White powder-coat finish.

e. Bottom panel shall be interlocking with cabinet and fastened with tamper proof quarter-turn fasteners.

B. Certification:

1. Safety Agency:
Units shall be listed by ETL indicating the units comply with the minimum requirements of the U.S. and Canadian national product safety standard, ANSI/UL Standard 1995, and with CAN/CSA C22.2 No. 236.

2. Capacities:
Fan coil capacities are certified and listed in accordance with AHRI Standard 440-2019.

C. Materials:

1. Coils:

a. All coils shall have 1/2″ copper tubes, manual air vent(s), and aluminum fins, galvanized end sheet, 10 fins per inch spacing, galvanized end sheets. Coil fins shall be mechanically bonded to copper tubes.

b. Copper tubes must comply with ASTM B-75.

c. Fin thickness shall be 0.0045″.

d. Tube thickness shall be 0.016″.

e. Coil rows shall be as indicated on the drawings.

2. Valves:

a. For installation in a 4-pipe system, unit shall be equipped with:

1) Valve size shall be as shown on the drawings.

2) Manual ball valves for service.

3) Motorized control valve, 300 psig service:

a) Primary 35 psid proportional with quick-release actuator.

b) Secondary 35 psid proportional with quick-release actuator.

b. Valve package shall be equipped with specialty devices as indicated on the drawings:

1) Coil connections –unions at the coil.

2) Flow Controls:

a) Primary - Return fixed flow control shall be specified on the equipment schedule.

b) Secondary - Return fixed flow control shall be specified on the equipment schedule.

3) Service Fittings:

a) Primary - Supply and Return P-T port.

b) Secondary - Supply and Return P-T port.

4) Strainer:

a) Primary - Y-Strainer with blowdown.

b) Secondary - Y-Strainer with blowdown.

3. Fans:

a. Fans shall be direct-drive, double-width fan wheels with forward-curved

blades.
b. Blower wheels shall be statically and dynamically balanced.
c. Scrolls and fan wheels shall be constructed of galvanized steel.
d. Shall be easily removable.

4. Motors:
   a. Motors shall be 3-speed, single phase, 60 Hz EC motors for 115 volts, permanently lubricated ball bearings.
   b. Motors shall be connected with quick connect electrical plugs.
   c. Motors shall have internal thermal overload protection with automatic reset.
5. Controls:
   a. Controls Voltage:
      1) Unit shall be equipped with 24VAC control.
   b. Control Package shall be equipped with specialty devices listed below:
      1) 24V condensate overflow switch.
      2) Thermostat and controls by DDC Contractor.
6. Operating Characteristics:
   a. A 4-pipe system shall be capable of providing heating and cooling on demand.
7. Electrical Requirements:
   a. Standard unit shall operate on 115volts, single phase, 60 Hz electrical power, and all exposed wiring shall be in flexible conduit.
8. Options and Accessories:
   a. Service switch with lock-out & tag-out features shall be factory installed. Circuit shall be non-fused.

2.03 BLOWER COIL UNITS (VBA)

A. Configuration:
1. General:
   a. Factory assembled belt drive blower coil units complete with DX (R-454B) coil, hot water coil, fan, motor, drive, drain pan, and all required wiring, piping and controls.
   b. Cabinet shall be made of heavy 18-gauge galvanized steel.
   c. Units shall be supplied with a duct collar for supply duct connection.
   d. The interior surfaces shall be lined with 1″ closed cell insulation. Insulation and adhesive shall meet NFPA-90A requirements for flame spread and smoke generation.
   e. Adhesive shall be certified according to the GREENGUARD Indoor Air Quality (IAQ) Certification for Low Emitting Products. Reference Standard: GGPS.001 GREENGUARD IAQ Standard for Building Materials, Finishes, and Furnishings. Reference Standard: GGPS.002 GREENGUARD Children & SchoolsSM Standard.
   f. Units shall have a removable, double-sloped stainless steel drain pan extending the entire width of the coil, with “telltale” second drain connection. Primary drain connection shall be 3/4” male NPT and “tell-tale” connection shall be 1/2” male NPT stainless steel fittings. Primary and secondary drain connections shall be located on the same end as coil connections.
   g. Stainless steel pans shall be externally coated with 2-part closed cell foam insulation.
   h. Units shall have 2” pleated MERV 8 filter.
2. VBA Vertical Belt Drive Units:
   a. Units shall be supplied with a duct collar for supply duct connection.
   b. Access panels on both sides of the cabinet shall be removable with tool.

c. Filter shall be removable from either side of the filter rack. Additional access shall be top filter access.

B. Certification:

1. Safety Agency:
   Units shall be listed by ETL indicating the units comply with the minimum requirements of the U.S. and Canadian national product safety standard, ANSI/UL Standard 1995, and with CAN/CSA C22.2 No. 236.
2. Capacities:
   Blower coil capacities are tested in accordance with AHRI Standard 440-2019.

C. Materials:

1. Coils:
   a. All coils shall have 1/2″ copper tubes, manual air vent(s), and aluminum fins, galvanized end sheets, 10 fins per inch spacing. Coil fins shall be mechanically bonded to copper tubes.
   b. Copper tubes must comply with ASTM B-75.
   c. Fin thickness shall be 0.0045″
   d. Tube thickness shall be 0.016″.
   e. Coil rows shall be indicated on the drawings.
   f. DX coils shall be supplied with a thermostatic expansion valve to provide refrigerant metering. The expansion valve shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be tested for operating ranges of entering temperatures from 20F to 120F.
2. Valves:
   a. For installation in a 4-pipe system, unit shall be equipped with:
      1) Valve size shall be as shown on the drawings.
      2) Manual ball valves for service.
      3) Motorized control valve, 300 psig service:
         a) Primary 35 psid proportional with quick-release actuator.
         b) Secondary 35 psid proportional with quick-release actuator.
   b. Valve package shall be equipped with specialty devices as indicated on the drawings:
      1) Coil connections –unions at the coil.
      2) Flow Controls:
         a) Primary - Return fixed flow control shall be specified on the equipment schedule.
         b) Secondary - Return fixed flow control shall be specified on the equipment schedule.
      3) Service Fittings:
         a) Primary - Supply and Return P-T port.
         b) Secondary - Supply and Return P-T port.
      4) Strainer:
         a) Primary - Y-Strainer with blowdown.
         b) Secondary - Y-Strainer with blowdown.
3. Blowers:
   a. Blowers shall be belt-driven, double-width fan wheels with forward-curved blades.
   b. Blower wheels shall be statically and dynamically balanced.
   c. Scrolls and fan wheels shall be constructed of galvanized steel.
   d. Blower housing shall be isolated from the cabinet and motor.
   e. Bearings shall be ball bearing type (no sleeve bearings allowed), permanently lubricated and sealed for life. Bearings shall be isolated from

the blower housing by rubber mounts set into heavy gauge metal support system.

f. Shaft shall be of solid steel (no hollow shafts allowed), keyed to drive components.

4. Drive:
   a. Drive shall consist of variable pitch motor pulley, fixed diameter blower sheave with keyed shaft and drive belt.
   b. Drive shall be designed for 120% of rated fan horsepower.
5. Motors:
   a. Motors shall be single speed with permanent split capacitor type, open drip proof, resilient mounted NEMA frame motor.
   b. Motors shall be connected with quick connect electrical plugs.
   c. Motor shall have internal thermal overload protection with automatic reset or fused overload protection.
   d. Motor service access shall be on same side as coil connections.
   e. Motor shall be mounted on adjustable base for belt tensioning and alignment.
6. Controls and Safeties:
   a. Control Voltage:
      1) Unit shall be equipped with 24VAC control.
   b. Control Package shall be equipped with specialty devices listed below:
      1) Condensate overflow switch.
   c. Refrigerant leak detection sensor for field installation
7. Options and Accessories:
   a. Unit shall be furnished with unit-mounted, factory-installed and interlocking fused disconnect switch. Fuses shall comply with NFPA 70E/IP20.

2.04 CONTROLS AND VALVES

A. Each unit shall be provided with thermostat with integral fan speed switch. Coordinate with controls.

B. Units shall be provided with factory mounted 2-way (3-way where noted) electrically operated control valves for the chilled water piping, and heating water piping.

C. A combination ball shutoff valve, with automatic flow control device, T&P port and union shall be provided in the leaving water piping for each unit.

D. A combination ball shutoff valve with T&P port and union shall be provided in the supply piping to each unit.

2.05 MANUFACTURERS:

A. Fan/Blower Coil Units:
   1. Trane.
   2. Carrier.
   3. International (IEC).
   4. Engineer Approved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that required utilities are available, in proper location and ready for use.

3.02 INSTALLATION

A. Install fan coil units in accordance with manufacturer's instructions.

B. Provide riser support at each floor level as recommended by unit manufacturer.

C. Hang fan coil units from building structure, with hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Install vertical blower coil units on 4” concrete equipment pad.

E. Protect units with protective covers during balance of construction.

3.03 CLEANING

A. Clean work under provisions of Division 1.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

D. Install new filters at substantial completion. Provide one complete set of replacement filters to Owner.

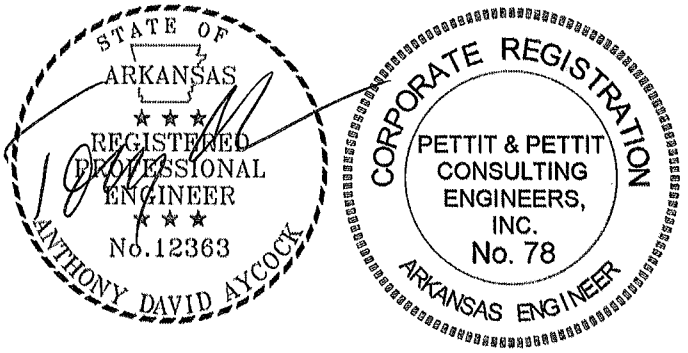
E. Provide one complete set of replacement belts to Owner.

END OF SECTION

The Engineer of Record for Divisions 26 and 28 of the Specifications for the Mechanical Renovations Project for Craighead County Courthouse HVAC Upgrades, Jonesboro, Arkansas, (P&P Job No. 23-077) is:

11-11-24

Date



SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 26, in addition to Division 1 - General Requirements.

1.02 REFERENCES

A. The following specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:
   1. American Society for Testing Materials.
   2. American Standards Association.
   3. Americans with Disabilities Act (ADA).
   4. Arkansas Energy Code (ASHRAE 90.1).
   5. Arkansas Fire Prevention Code, 2021 Edition.
   6. Illuminating Engineering Society.
   7. Institute of Electrical and Electronic Engineers.
   8. International Building Code, 2021 Edition.
   9. Local, City and State Codes and Ordinances.
   10. National Electrical Code, 2023 Edition.
   11. National Electrical Manufacturers Association.
   12. National Electrical Safety Code, 2002 Edition.
   13. National Fire Protection Association's Recommended Practices.
   14. Occupational Safety and Health Act.
   15. Power Cable Engineers Association.
   16. Service requirements of serving utility company.
   17. Underwriter's Laboratories, Inc.

1.03 SUBMITTALS

A. Submit six (6) sets of shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. The basic information for each item of equipment to be included is as follows:
   1. Index.
   2. Installation and Operating Instructions
      a. Individual tabbed sections.
      b. Manufacturer descriptive literature.
      c. Applicable control diagrams.
      d. Composite wiring diagrams.
   3. Each submittal sheet shall be clearly marked with equipment Catalog Number and accessory items being submitted.

1.04 REGULATORY REQUIREMENTS

A. Work shall conform to all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

B. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may at his option propose any article, approved equal to or better than that specified, as approved in writing by the Engineer.

C. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

D. In case of difference between building codes, specifications, state laws, local ordinances,

industry standards, and utility company regulations and the contract documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

E. Non-Compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.

F. All required fees, permits and inspections shall be obtained and paid for by the contractor under the section of the specifications for which they are required.

1.05 ELECTRICAL LICENSE REQUIREMENT

A. No person shall perform electrical work on the Contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiner's Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one-to-one ratio.

B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

C. The Arkansas Department of Labor requires that the worker, who installs raceway for low voltage cables of temperature controls, fire alarm, telecommunications, intrusion detection, access control, public address, television distribution, etc., be paid the electrician’s minimum wage rate.

1.06 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. The Engineer/Owner reserves the right to relocate any device a maximum distance of 6'-0" at the time of installation without an extra cost being incurred.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.07 CONTRACTOR REVISED DRAWINGS

A. The Contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.

B. Upon completion of the work and prior to final payment, the Contractor shall furnish to the Engineer, one set of "contractor revised" reproducibles, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

1.08 GUARANTEE

A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.

B. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of one (1) year.

1.09 OPERATING AND MAINTENANCE MANUALS

A. After approval of materials and equipment for use in this project, 3 copies of an Operation and Maintenance Manual shall be submitted for approval.

B. The basic information for each item of equipment to be included is as follows:

1. Index
2. Maintenance and operating instructions
    a. Manufacturer's descriptive literature and maintenance manuals
    b. An Approved Set of Shop drawings
    c. Applicable control diagrams
    d. Composite wiring diagrams as applicable showing all motor controllers, relays, etc., with interlocking provisions as built in the job, along with a written description of the control sequence if applicable.
    e. Spare parts list (when parts are provided)
    f. Listing of part suppliers and their addresses
    g. Single line diagram of the "as built" building electrical distribution system.

C. Upon final approval, submit one (1) bound copy of the approved Operation and Maintenance Manual to the Engineer and hold two (2) copies for instruction of Owner as hereinafter specified.

1.10 CONFLICTS BETWEEN DRAWINGS AND SPECIFICATIONS

A. If a conflict between the drawings and the specifications occurs, the most stringent requirement shall apply.

PART 2 PRODUCTS

2.01 UL LISTING

A. Where the Underwriter's Laboratories have an applicable standard, the product shall be listed with UL and shall be so marked.

2.02 SUBSTITUTIONS

A. Each Section of the Project Manual, when applicable has a paragraph entitled “Manufacturers”. If “Engineer Approved Equal” is not in the list of manufacturers, no substitutions will be accepted. Submit one of the manufacturers listed.

B. The Engineer does not give any prior approvals on submittals. Do not call the Engineer for prior approval.

PART 3 EXECUTION

3.01 600 VOLT INSULATION TEST

A. Prior to energizing the electrical system, the contractor shall provide insulation resistance tests for all distribution and utilization equipment. The Contractor shall provide a suitable and stable source of test power. The insulation test shall be a "megger" test at 500 volts D.C. for one-half minute. A test report shall be submitted to the Engineer. The minimum insulation resistance for No. 12 AWG conductors shall be 1,000,000 ohms and for larger conductors shall be 250,000 ohms. Conductors testing below the minimum insulation resistance shall be replaced and tested again.

3.02 CONTINUITY TEST

A. The Contractor shall perform a continuity test on the entire electrical system prior to energizing the system to insure proper cable connections.

3.03 CONNECTION TORQUE TESTS

A. All No. 1/0 AWG and larger conductors with bolted connections shall be torque tested using a torque wrench. Torque shall be to National Electrical Testing Association's (NETA) Standards.

3.04 REMOVAL OF RUBBISH

A. Contractor shall remove his rubbish from building site at intervals and shall maintain the spaces allotted him in an orderly manner. On completing his work, and prior to submission of final estimate, he shall remove all tools, appliances, material and rubbish from the grounds.

3.05 GROUND RESISTANCE MEASUREMENTS

A. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Engineer. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and grounding system and submission of test results to the Engineer. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the soil conditions at the time the test was performed. When the building water service is used as a ground of part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142. Submit test reports with Operation and Maintenance Manuals.

3.06 MECHANICAL OPERATION TESTS

A. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are functioning.

3.07 ROTATIONAL TESTS

A. The Contractor shall assist Division 23 in performing rotational tests on all motors. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor's color coding shall be changed.

3.08 INSTRUCTING OWNER'S REPRESENTATIVE

A. The Contractor shall instruct representatives of the Owner in the proper operation and maintenance of all elements of the Electrical system.

B. Contractor shall spend not less than one (1) day in such formal instruction to fully prepare the Owner's representative to operate and maintain the Electrical systems.

3.09 UL LISTINGS

A. The Contractor shall bear all responsibility for any work, which he performs, that voids any UL listings of any equipment.

3.10 OWNER OCCUPIED BUILDINGS

A. Holes cut in Owner occupied buildings shall be done with drills with vacuum attachments that vacuum cuttings as the drill cuts.

B. All drilling, hammering, or other loud construction activities shall be done after Owner’s normal working hours.

C. Conduit cutting will be done outside.

D. Contractor shall clean work area at the end of each day.

3.11 OBJECTIONABLE NOISE AND/OR HARMONICS

A. If after installation of the electrical system, it is found that objectionable noise or harmonics exists on the electrical system, the manufacturer of the equipment which is producing the objectionable noise or harmonics shall install the proper electrical equipment to prevent the noise and/or harmonics from emitting onto the building’s electrical system and shall be contained within the offending equipment.

3.12 VOLTAGE MEASUREMENTS

A. Contractor shall measure and record voltage at service equipment with as much load on the system as possible. Contractor shall measure and record phase-to-phase, phase-to-neutral, and phase-to-equipment ground voltages for each phase. Where harmonic cancellation

transformers are installed, contractor shall also measure and record phase-to-phase, phase-to-neutral and phase-to-equipment ground voltages for each phase on the secondary side of the transformers. Contractor shall submit records of these voltages with the Operation and Maintenance Manuals.

3.13 REMOVAL OF PAINT AND OTHER FINISHES

A. The contractor shall remove all paint and other non-factory finishes applied inadvertently by other subcontractors to all electrical equipment.

3.14 TEMPORARY CONSTRUCTION POWER AND LIGHTING

A. The contractor shall provide all necessary temporary construction power and lighting to accomplish the work.

B. After the construction is completed, the contractor shall remove all temporary construction power and lighting.

3.15 PROJECT PHASING

A. The contractor shall become familiar with the project phasing prior to his bidding the project and shall include in his bid, the amount of money required by him to provide the necessary labor, materials, adjustments, programming, reprogramming, and accessories to provide the project in the phases shown within the general conditions of the contract documents.

END OF SECTION

SECTION 26 0501
ELECTRICAL DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

1.02 REGULATORY REQUIREMENTS

A. Conform to the requirements of NFPA 70 - National Electrical Code.

1.03 DESCRIPTION OF WORK

A. The extent of general building demolition work is shown on drawings. Coordinate the required electrical work with the general demolition.

B. Demolition includes removal and disposal of demolished materials, as shown on drawings and herein specified.

C. Interior demolition includes work in crawl spaces, work above ceilings, finishes, and removal and disposal of demolished materials, as shown on drawings and herein specified.

D. The Owner shall have the option of retaining any items removed. The Contractor shall dispose of all material off site, unless directed otherwise by Owner.

1.04 JOB CONDITIONS

A. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.
   1. Conditions of the structure existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work. The drawings are schematic and provided as an aid in bidding. The contractor shall visit the site and determine the actual conditions prior to bidding.

B. Partial Removal: Items of salvable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.
   1. Storage or sale of removed items on site will not be permitted.

C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, occupied areas, and other adjacent occupied or used facilities.

D. Protections: Ensure safe passage of persons around or through area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
   1. Install temporary electrical services, lighting, etc. as required by the Owner or authorities having jurisdiction.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

F. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Allow no interruption in service unless coordinated with Owner at least 24 hours in advance.
   1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing fire utilities, as acceptable to governing authorities.
   2. Contractor will disconnect and seal utilities serving each structure to be demolished, or interior area to be demolished, prior to start of demolition work.

G. If Contractor is required to disconnect utility services or other services to an occupied area the Contractor shall provide temporary or alternative services to that area.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove all branch and feeder conduit and wire back to panelboards.
   1. Where walls, ceilings, or floors are to remain, remove all devices, and wire where indicated. Provide blank cover plate at outlet box or patch wall to match existing finish as directed by the issued documents and/or the Architect/Engineer.
   2. All items shown to remain active shall be furnished with necessary accessible junction boxes and all conduit and wire as required to maintain circuit continuity.
   3. All outlet boxes which must be removed due to demolition but which must remain active in order to maintain circuit continuity shall be relocated into ceilings or walls and shall be accessible.
   4. All material, fixtures, and equipment to be reused shall be removed and stored on site. Before reinstallation all items are to be cleaned, tested, and prepared for re-use. Fixtures shall be re-lamped and new ballasts installed.
   5. Correct existing directories of load centers, panelboards, and switchboards where circuits are removed and/or added. Corrections to existing directories of load centers and panelboards shall be neatly handwritten. Nameplates are required at switchboards.
   6. Conduit in a concrete slab or that is not shown to be reused, may be abandoned provided as follows:
      a. Conduits in slab shall be cut off at top of slab.
      b. Underground conduits shall be removed to 12 inches below grade before being abandoned.
   7. Fire seal all holes in fire and/or smoke walls and floors where conduits are removed.

B. Remove all accessible low-voltage cables that are not to be reused.
   1. This includes data, telephone, television, audio/visual, intercom, fire alarm, security, access control, public address, and temperature control cables.
   2. Fire seal holes where these cables penetrated fire and/or smoke walls and floors.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove from site debris, rubbish, and other materials resulting from demolition operations. Pay all fees related to removal and dumping.
   1. Remove and dispose of interior demolition debris only.
   2. Burning of removed materials from demolished structures will not be permitted on site.

B. Removal:
   1. Transport materials removed from demolished structures and dispose of off site.

C. Store items that Owner wishes to retain as directed by the Owner.

3.03 OUTAGES

A. The Contractor shall schedule all outages with the Owner at least two weeks in advance. Owner has the right to approve or disapprove any scheduled outages. Contractor will schedule the outage at the Owner's convenience. Contractor shall pay all costs, including overtime, necessary for the outage work schedule.

B. Refrigerators and freezers shall not be turned off for more than 1 hour. If the Contractor needs more than 1 hour, he shall install a temporary feeder to the equipment and/or rent an emergency generator to power the equipment. Contractor shall pay all costs of the generator and/or temporary feeders at no additional cost to the Owner.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.02 RELATED SECTIONS

A. Section 26 0529 – Hangers and Supports for Electrical Systems.

B. Section 26 0533 – Raceway and Boxes for Electrical Systems.

C. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NETA – National Electrical Testing Association.

C. UL 83 - Thermoplastic Insulated Wires and Cables.

D. UL 486 A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

E. UL 486 C - Splicing Wire Connectors.

F. UL 1581 - Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.04 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide for each wire and cable type.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductors shall be copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

D. Where wire and cable routing are not shown, and destination only is indicated, determine exact routing and lengths required.

1.08 COORDINATION

A. Determine required separation between cable and other work.

B. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.01 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Southwire.

B. American.

C. Engineer Approved.

2.02 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THW (feeder circuits).

E. Metal clad cable for branch circuits.

2.03 WIRING CONNECTORS/LUGS

A. All cable and wire terminals, lugs, taps, and splices shall be made secure with compression type connectors, approved for the service. Connections shall be installed with approved tools and dies to assure a permanent secure joint. Compression joints shall be cleaned and made smooth with insulating compound. Connectors in dry locations shall be wrapped with varnish cambric and insulated with approved electrical grade plastic tape. Where conductors are to be connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are to be installed. Provide all necessary hangers, racks, cleats, and supports required to make a neat installation. Wire connectors shall conform to UL 486.

B. Connectors in wet or damp locations shall be covered with heat shrinkable products equal to Scotch #ITCSN Series.

C. Contractor shall provide and install all connectors, taps, lugs, and splices as required to connect all wires and cables provided under the contract. Contractor shall torque all bolted connections to manufacturer’s specifications. If manufacturer’s specifications do not apply, use NETA specifications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to installation verify that interior of building has been protected from weather.

B. Prior to installation verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Interior Locations: Use only building wire, Type THW or use THHN/THWN insulation, in raceway. For feeders: All metal clad cable for branch circuits.

B. Exterior Locations: Use only building wire, Type THW or THHN/THWN insulation in raceway.

C. Underground Installations: Use only building wire, Type THW or USE insulation in raceway.

D. Use wiring methods indicated on Drawings.

3.04 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Use stranded conductors for control circuits 24 volts and below. Minimum size shall be No. 16 AWG.

C. Use conductors not smaller than No. 12 AWG for power and lighting circuits and 120 volt control circuits.

D. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet or where the distance to the first outlet exceeds 50 feet.

E. Pull all conductors into raceway at same time.

F. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger.

G. Protect exposed cable from damage.

H. Support cables above accessible ceiling, using spring metal clips to support cables from structure.

I. Use suitable cable fittings and connectors.

J. Neatly train and lace wiring inside boxes, equipment, and panelboards.

K. Clean conductor surfaces before installing lugs and connectors.

L. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Split bolt connectors are not allowed.

M. Use sleeve compression connectors for copper conductor splices and taps, No. 6 AWG and larger. Insulated uninsulated conductors and connector with heat shrink insulation rated 600 volts.

N. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.

O. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.

P. Route circuits at own discretion; however, circuit numbers shall be according to Drawings.

Q. Run conductors of same circuit in same conduit.

R. Run conductors of different voltage system in separate conduits.

S. Color-code conductors as follows:

240/120 Volts
Black
Red
Green
White

T. Contractor shall not install more than three (3) current-carrying conductors in one conduit without derating the conductors per NEC Table 310-15(b)(2)(a).

U. Where cables not in conduit pass through floors, cables shall be enclosed in conduit extending at least 6 inches above the floor.

V. Cables shall be protected from physical damage where necessary by conduit.

W. All cable splices shall be made in boxes.

X. The radius of bends in cables shall not be less than five times the diameter of the cable.

Y. Cables shall be secured by staples, straps, j-hooks, or similar fittings every 4-1/2 feet and within 12 inches of every cabinet, box and fitting.

Z. Do not pull cable sheaths back more than necessary to separate conductors.

AA. Do not score conductors when peeling back conductor insulation. Scored conductors will be replaced.

BB. Do not cut off strands from stranded conductors at terminations. Conductors with strands missing shall be replaced.

CC. Kinked, torn, or twisted cable sheaths are unacceptable and shall be replaced.

DD. Install wire and cables to avoid chemicals, cold temperature bending, and different lengths of conductors of same circuit.

EE. Make sure conduits are properly terminated, reamed and brushed before installation of wire and cables.

FF. Cable sheaths shall be held in place by strain relief fittings.

GG. Verify proper conductor location at each termination before energizing.

HH. All parallel conductors shall be of the same length, type, size and shall have the same connector pressures.

II. Do not splice service entrance or feeder conductors.

JJ. Maintain 18-inch clearance from all wires and cables to hot water pipes, steam pipes, and flues.

KK. Route all cables parallel and perpendicular to walls. This includes cables installed above ceilings, in attics, and in crawl spaces.

3.05 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of 26 0553 – Identification for Electrical Systems.

B. Identify each conductor with its circuit number or other designation indicated on Drawings in each junction box, switch, switchboard, control panel, and in each panelboard.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values, if applicable. If not applicable, use NETA’s recommended values.

D. Verify continuity of each branch circuit conductor.

E. Check tightness of all connections.

3.07 USE OF THE FOLLOWING IS PROHIBITED

A. Aluminum conductors.

B. Wire nuts in damp or wet locations.

C. Copper-clad aluminum conductors.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Chemicals.

E. Conduit.

1.02 RELATED SECTIONS

A. Section 26 0533 – Raceway and Boxes for Electrical Systems.

B. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. UL 467 - Grounding and Bonding Equipment.

1.04 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe, if any.

B. Metal frame of the building, if any.

1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: No greater than 5 ohms.

1.06 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of exothermic connectors.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of grounding electrodes.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

1.09 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 PRODUCTS

2.01 WIRE

A. Material: Stranded or solid copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

C. Wire shall conform to Section 26 0519.

2.02 CONDUIT

A. Conduit shall conform to Section 26 0533.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed around area where chemical ground is to be installed.

3.02 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus or bushing.

C. Size and type of green equipment ground conductors and method of securing then to obtain electrical continuity and effective grounding as per National Electrical Code, Article 250. Conduit shall not be used for grounding.

D. Neutrals shall be grounded in accordance with the National Electrical Code.

E. All metal raceway system, including cabinets, conduit and boxes, shall be grounded in accordance with the National Electrical Code.

F. An equipment ground conductor shall be installed in all conduits.

G. All unburied grounding conductors shall be installed in conduit.

H. Connect equipment ground conductor of branch circuits serving gas appliances to metallic gas lines. Do not use metallic gas lines as a grounding electrode of the electrical system.

I. Ground all metal non-current carrying equipment. Ensure that bonding breaks through paint to bare metallic surface of all painted metallic equipment.

3.03 FIELD QUALITY CONTROL

A. Inspect equipment grounding conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, cable and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NECA - National Electrical Contractors Association.

C. UL 514B - Fittings for Conduit and Outlet Boxes.

1.03 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners, and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Perforated strap iron will not be acceptable as hanger or fastening material.

D. Plastic tie wraps will not be acceptable as support materials, except:
   1. Inside enclosures to neatly train cables and wires.

E. Channels shall be galvanized and not painted.

F. All hardware shall be galvanized.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and other conduit.

D. Obtain permission from the Engineer before using powder-actuated anchors.

E. Obtain permission from the Engineer before drilling or cutting structural members.

F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers

under all nuts.

G. Install surface-mounted cabinets with minimum of four anchors. Provide blocks between studs to support anchors.

H. In wet and damp locations use steel channel supports to stand cabinets one inch off wall.

I. All conduits, both horizontal and vertical, shall be accurately supported. Each hanger shall be properly sized to fit supported conduit.

J. Where lines are supported under concrete construction, hanger rods shall be secured with concrete inserts.

K. All hangers shall be so located as to properly grade and support horizontal conduits without appreciable sagging of these lines.

L. Where multiple conduits are run horizontally at the same elevation and grade, they may be supported on trapezes of channels suspended on rods. Trapeze numbers, including suspension rods, shall be properly sized for number, size, and loaded weight of conduits to be supported.

M. Conduit supports shall be installed within 3 feet of each coupling, connector, and box.

N. Electrical contractor shall install his own supports for his equipment.

O. All 2 inch and larger conduits shall have a swivel hanger support equal to B-Line #B446 or #B446C.

END OF SECTION

SECTION 26 0533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid steel conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Surface mounted raceway.

F. PVC conduit.

G. Fittings and conduit bodies.

H. Wall and ceiling outlet boxes.

I. Floor boxes.

J. Pull and junction boxes.

1.02 RELATED SECTIONS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 – Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 2726 - Wiring Devices.

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

D. NECA "Standard of Installation”.

E. NEMA TC 3 - PVC Fittings to Use with Rigid PVC Conduit and Tubing.

F. UL 1 - Flexible Metal Conduit.

G. UL 5 - Surface Metal Raceways and Fittings

H. UL 6 - Rigid Metal Conduit.

I. UL 360 - Liquid-tight Flexible Steel Conduit.

J. UL 652 - Schedule 40 and 80 Rigid PVC Conduit.

K. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

L. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

M. UL 38 - Boxes for Use with Fire-Protection Signaling Systems, Manually Actuated Signaling.

N. UL 50 - Cabinets and Boxes.

O. UL 514A - Metallic Outlet Boxes.

P. UL 514B - Fittings for Conduit and Outlet Boxes.

Q. UL 996 - Electrical Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

R. UL 1241 - Junctions Boxes for Swimming Pool Lighting Fixtures.

S. UL 1773 - Termination Boxes.

T. UL 65 - Wired Cabinets.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, non-metallic conduit, fittings, and conduit bodies.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.06 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 2 inches.

B. Submit under provisions of Division 1.

C. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Inspect all conduit for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit and openings prior to rough-in.

C. Route conduit as shown on Drawings in approximate locations unless specifically dimensioned. Route as required to complete wiring system.

D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. The exact location of all electrical boxes shall be as approved by Engineer who reserves the right to change any outlet for a distance of 6 feet in any direction from position shown on plans, before work is roughed-in, without extra charge.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:
   1. Conduit installed below grade shall be Schedule 40 PVC. All elbows and riser up thru floor slabs shall be galvanized rigid steel conduit (RSC).
   2. All conduit not installed under the floor slab shall be 24 inches below grade unless otherwise noted.

C. Outdoor Locations, Above Grade, and On Roofs: Use galvanized rigid steel conduit. On roofs install 4 inch by 4 inch square treated wooden blocks on roof to support rigid steel conduit within 3'-0" of each coupling and box and to support liquidtight flexible conduit every 3'-0".

D. Dry Locations:
   1. Concealed: Use electric metallic tubing.
   2. Exposed:
      a. Use electric metallic tubing.

E. Electrical metallic tubing (EMT) is to be used for all HVAC equipment control wiring. The conduit system for HVAC temperature controls is to be furnished and installed by Division 23 in accordance with the requirements specified herein. Line voltage control work not specifically shown on the electrical drawings shall be furnished and installed by Division 23 with all line voltage work and all conduit work performed by licensed electricians.

2.02 RIGID STEEL CONDUIT

A. Manufacturers:
   1. Allied.
   2. Triangle.
   3. Engineer Approved.

B. Rigid Steel Conduit: ANSI 80.1

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. Allied.
   2. Triangle.
   3. Engineer Approved.

B. Description: Interlocked steel construction.

C. Fittings: ANSI/NEMA FB 1.

D. Maximum Length: 6'-0".

2.04 LIQUIDTIGHT METAL CONDUIT

A. Manufacturers:
   1. Allied.
   2. Triangle.
   3. Engineer Approved.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

D. Maximum Length: 6'-0".

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied.
   2. Triangle.
   3. Engineer Approved.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast compression type.

2.06 NONMETALLIC CONDUIT

A. Manufacturers:
   1. Carlon.
   2. Engineer Approved.

B. Description: NEMA TC 3; Schedule 40 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.07 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, include 1/2-inch male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.
   3. Receptacle, single switch, and 2 gang switch boxes for wood studs shall be Raco #194 or #235 with plaster ring of proper depth.
   4. Receptacle, single switch, and 2 gang switch boxes for metal studs shall be Raco #196 or #235 with plaster ring for proper depth.
   5. Gang switches of 3 or more devices for wood or metal studs and exposed work shall be Raco #950 Series, appropriate gang box and raised cover.
   6. Lighting fixture outlet boxes for wood or metal studs, masonry walls, and furred ceilings shall be Raco #166, #167, or Raco #194 or #235 with plaster ring.
   7. Junction boxes for wood or metal studs, masonry walls, furred ceilings and interior exposed work shall be Raco #231, #232, #233, or #235.
   8. Receptacle boxes for masonry walls shall be Raco #695 or #191 with #785 device cover.
   9. Switches in 6 inch and wider masonry walls shall be 3-1/2-inch-deep masonry boxes of gang required. Masonry boxes in 4-inch walls shall be 2-1/2 inches deep.
   10. Television outlet boxes shall be Raco #246, 4-1/16-inch box with #836 device cover ring. Telephone outlet boxes shall be Raco #256.
   11. Outlet boxes for interior exposed work in unfinished areas shall be Raco #191, #192, #231, or #232 boxes with 1/2 inch raised, 4-inch square cover of appropriate configuration.
   12. Boxes, for interior exposed work on existing walls and ceilings in finished areas in existing buildings, where it is impossible to fish conduit down walls or above ceilings, shall be boxes as manufactured by the surface metal raceway manufacturer for the intended purpose.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer.

C. Boxes shall be oversized when required by Table 370-16(a) of the National Electrical Code.

D. Specialty A/V floor boxes shall be as scheduled on the drawing, ”FSR” or equal

2.08 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type as required; flat-flanged, surface-mounted junction box.
   1. Material: Galvanized steel.

C. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation".

B. Install surface metal raceway in accordance with manufacturer's directions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Supports shall be installed within 3 feet of every outlet box, junction box, panel, or other conduit terminations. Fastening of unbroken lengths shall be permitted to be increased to a distance of 5 feet where structural members do not readily permit fastening within 3 feet. Do not space supports further than 10 feet apart.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 0529.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route all conduit parallel and perpendicular to walls. This includes conduit installed above ceilings, in attics, on roofs, and in crawl spaces.

K. Install insulated bushings or approved equivalent on each end of all conduit.

L. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

M. Cut conduit square using saw or pipe cutter; de-burr cut ends.

N. Bring conduit to shoulder of fittings; fasten securely.

O. Install no more than equivalent of four 90-degree bends between boxes. Use factory elbows for all 90-degree bends in conduits 1" and larger.

P. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

Q. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.

R. Use suitable caps to protect installed conduit against entrance of dirt and moisture during construction.

S. Ground and bond conduit under provisions of Section 26 0526.

T. Identify conduit under provisions of Section 26 0553.

U. Provide suitable pull-boxes in all conduit runs as required by the National Electrical Code and as required to facilitate wire installation.

V. Holes for passage of conduits through all one-hour and two-hour drywall partitions shall be neatly cut to the required size. If holes are cut larger than necessary, they shall be covered with two (2) additional pieces of 5/8 inch type X gypsum wallboard, each 8 inches by 16 inches with a half circular cutout of the proper size, one (1) layer on one-hour partitions, and two (2) layers on two-hour partitions.

W. Holes for passage of conduits through one-hour, two-hour, and four-hour masonry walls shall be

fireproofed. Fireproofing materials shall be as follows:

1. Cellular Glass Insulation: Pittsburgh Corning Corp. Foamglas "Regular" or UL rated or UNI-JAC UL rated pipe insulation, or approved equal.
2. Fire Retardant Putty: IPC Flamesafe Type FAS500 or FST600 Series, or improved equal, for one-hour and two-hour walls.
3. IPC/KB5 Mortar Seal, or approved equal (full depth of wall) for four-hour walls.

X. Holes for passage of conduits through masonry floors shall be fireproofed. Fireproofing material shall be Firestop Compound - IPC Flamesafe Type 500/FST 600, or approved equal, filled to full depth of slab. Minimum annular space around conduit shall be 3/16 inch.

Y. Refer to Architectural drawings for locations of fire-rated walls, ceilings, and floors.

Z. Support 2-1/2 inch and larger conduit in accordance with Section 26 0548.

AA. All flexible conduit in Mechanical Rooms and outside shall be liquidtight flexible conduit.

BB. Conduits, which enter refrigerated areas, such as walk-in coolers and wall-in freezers, shall have a seal-off installed on the non-refrigerated side of the conduit where the conduit exits or enters the refrigerated area.

CC. Make sure conduits are properly terminated, reamed, and brushed before installation of wire or cable.

DD. Install bushings on all conduits.

EE. Structural Engineer shall approve placement of conduits in all concrete slabs, beams, and columns. See Structural Drawings for structural engineer’s name and address.

FF. Conduits which pass from an air-conditioned space to a non-air-conditioned space shall have seal-offs installed on non-air-conditioned side near wall.

GG. Ground metallic conduits.

HH. Install gasketed conduit hubs on all conduits exiting the top or sides of NEMA 3R enclosures.

II. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

JJ. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

KK. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

LL. Install boxes to preserve fire resistance rating of partitions and other elements.

MM. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

NN. Use flush mounting outlet boxes in finished areas, unless noted otherwise on the Drawings.

OO. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24-inch separation in acoustic rated walls. See Architectural floor plans for acoustic rated wall locations.

PP. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

QQ. Use stamped steel bridges to fasten flush mounting outlet box between studs.

RR. Install flush mounting box without damaging wall insulation or reducing the effectiveness.

SS. Use adjustable steel channel fasteners for hung ceiling outlet box.

TT. Do not fasten boxes to ceiling support wires.

UU. Support boxes independently of conduit.

VV. Use gang box where more than one device is mounted together. Do not use sectional box.

WW. In other than masonry, use 4-inch square by 1-1/2 inch minimum box with plaster ring for single devices.

XX. Use cast outlet box in exterior locations exposed to the weather and wet locations.

YY. Use cast floor boxes for installations in slab on grade. See plans for specialty A/V floor-boxes equal to FSR. Coordinate cover trim with floor covering thickness and type.

ZZ. Set floor boxes level.

AAA. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
1. Interior Dry Locations: Use hinged enclosure.
2. Other Locations: Use surface-mounted cast metal box.

BBB. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.

CCC. Boxes for light switches shall generally be located within 6 inches of door jamb.

DDD. Pull-boxes shall be provided at points shown on plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction. No runs of over 100 feet shall be made without use of pull-box.

EEE. All boxes shall have covers. All boxes installed above a ceiling and installed in unfinished spaces (Mechanical and Electrical Rooms, etc.) shall have the covers clearly and legibly marked with the circuits contained within them.

FFF. All flush-mounted boxes shall come within 1/4 inch of finished non-combustible surfaces and shall be flush with finished combustible surfaces. Install box extensions, if after rough-in and wall construction, the boxes do not come out far enough.

GGG. Ground all boxes. Ensure that bonding breaks through paint to bare metallic surface.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance of partitions and other elements.

B. Pull-boxes shall be provided at points shown on the plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction.

C. All threaded conduit shall be secured to boxes, cabinets, panels, switches, etc. by means of a threaded bushing on the inside and lock-nutted on the box exterior and interior.

D. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

E. Coordinate mounting heights and locations of outlets mounted above counters, branches, and backsplashes with Architect prior to rough-in.

F. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.03 THE FOLLOWING ARE PROHIBITED

A. EMT crimp-on, tap-on, indenter type fittings.

B. EMT set- screw fittings. Set-screw fittings on ends of flexible conduit are allowed.

C. PVC inside buildings, or above grade.

D. All thread nipples in other than dry locations.

E. Wooden plugs inserted in concrete or masonry units as bases for fastening conduits, tubing, boxes, cabinets, or other equipment.

F. Installation of conduit or tubing which has been crushed or deformed.

G. Where conductors #8AWG or larger are inside, the following fittings shall not be used:
   1. 90° threaded hubs.
   2. Pulling elbows.
   3. Bushed elbows.
   4. Short box connectors.
   5. 90° connectors.
   6. Entrance elbows.
   7. Types LB, LL, LR, T, L, TA, TB, X, LBD, or LBDN conduit bodies.
   8. Short elbows.

H. Type ENT tubing.

I. Armored cable.

J. Metal-clad cable.

K. EMT on roof, exposed, outside, in concrete, or underground.

L. Flexible or liquidtight flexible conduits concealed in walls or floors.

M. PVC elbows.

N. Storage of PVC in sunlight.

O. The use of heat to bend PVC conduit.

P. Surface non-metal raceway.

Q. Surface metal raceway in new buildings.

R. Surface metal raceway in damp or wet locations.

S. Flexible or liquidtight flexible conduits in lengths exceeding 6'-0".

T. The use of external cover clips on surface metal raceway.

U. All steel EMT fittings.

V. Flexible conduit connectors on which the flexible conduit is threaded.

W. Plastic boxes.

X. Fiberglass boxes.

END OF SECTION

SECTION 26 0548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. The requirements for seismic protection measures to be applied to electrical equipment specified herein are in addition to any other items called for in other sections of these specifications. The seismic protection shall conform to Category D of the 2021 Arkansas Fire Prevention Code. The electrical equipment shall include the following items to the extent required on plans or in other sections of the following specifications:

Conduit, 2-1/2 inches or larger
Panelboards
Cable Trays
Switches
Light Fixtures
Switchboards
Communication Racks

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Basic Electrical Requirements - Section 26 0500.

1.03 APPLICABLE PUBLICATIONS

A. American National Standards Institute, Inc. (ANSI):
1. B18.2.1-1981
2. B18.2.2-1972

B. American Society for Testing and Materials (ASTM):
1. A36-84a
2. A307-84
3. A325-85
4. A501-84
5. A576-81

C. Federal Specifications:
1. RR-W-410D

D. NEMA
1. 250 Enclosures for Electrical Equipment
2. IC56

1.04 REGULATORY REQUIREMENTS

A. Conform to NFPA 70 - National Electrical Code and International Building Code.

B. Conform to 2021 Fire Prevention Code.

PART 2 PRODUCTS

2.01 Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

2.02 Sway brace of structural steel conforming with ASTM A36.

2.03 Mechanical couplings of the sleeve type to provide a tight flexible joint under all reasonable conditions.

2.04 Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B12.2.2 and ASTM A307 or 306.

2.05 Guy wires where required shall conform to Fed Spec. RR-W-441 as follows:

5/32" diameter	Type V, Class 1
3/16" to 5/16" diameter	Type V, Class 2
1/4" to 5/8" diameter	Type I, Class 2

PART 3 EXECUTION

3.01 All rigidly mounted equipment will have a minimum of four (4) anchor bolts securely fastened through bases or backs. Anchor bolts must conform to ASTM A307. Anchor bolts shall have an embedded straight length equal to at least twelve times the nominal diameter of the bolt and shall conform to the applicable tables for various equipment weights.

Maximum Equipment Weight (Pounds)	
500	1/2
1,000	1/2
5,000	1/2
10,000	1/2
20,000	1/2
30,000	5/8
50,000	3/4
100,000	1

Based on four (4) bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional area when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure, except that an equipment weight equal to five times the actual equipment weight shall be used. Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

3.02 Equipment Sway Bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with no less than 1/2-inch bolts. Braces shall conform to all applicable codes and standards for Seismic Classification. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45-degrees, provided that supporting members are properly sized to supporting operating weight of equipment when inclined at a 45-degree angle.

3.03 All recessed fluorescent light fixtures shall have seismic clips firmly situated over tops of ceiling grid tees or plaster frames.

3.04 Sway bracing shall be provided for all 2-1/2 inch or larger conduits, not individually supported with hangers 12 inches or less in length.

3.05 All 2-1/2 inch or larger conduits entering or leaving a building or structure shall have a flexible seismic expansion fitting installed within the earth prior to entering the building or after leaving the building. Fitting shall be within 5'-0" of building or structure. Fitting shall be equal to Appleton Type DF.

3.06 All light fixtures that weight more than 50 pounds shall have a safety chain or safety cable in addition to its other support.

3.07 Sway bracing shall be provided for all cable trays.

3.08 Communications racks shall be bolted to floor. Tops of racks shall be bolted to walls.

3.09 Cable trays and conduits shall be independently supported and braced independently of the ceiling.

3.10 Powder-activated fasteners (shot pins) shall not be used for anchorage.

3.11 Vibration isolators shall have a bumper restraint in each horizontal direction, and vertical restraints shall be provided where required to resist overturning.

3.12 Internal coils of dry type transformers shall be positively attached to their supporting substructure within the transformer enclosure.

3.13 Slide-out components in electrical equipment shall have a latching mechanism to hold contents in place.

3.14 Electrical cabinet design shall conform to NEMA 250 and NEMA IC56.

3.15 The attachment of additional items weighing more than 100 pounds to electrical equipment is prohibited.

3.16 Friction clips shall not be used for anchorage attachments.

3.17 Oversized plate washers extending to the equipment wall shall be used at bolted connections through the base sheet metal if the base is not reinforced with stiffeners or not capable of transferring the required loads.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Trench tape.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.03 RELATED SECTIONS

A. Section 09 900 - Painting: Boxes.

1.04 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
   1. Each electrical distribution equipment (switchboards, panelboards, enclosed circuit breakers, motor control centers, transformers) and control equipment enclosure (starters, disconnect switches, etc.).

C. Letter Size:
   1. Use 1/2-inch letters for identifying equipment designation and voltage.

D. Provide typewritten directory in each panelboard of circuit designations in clear/transparent protective envelope attached to inside of panelboard door.

E. Provide typewritten zone directory in each conventional fire alarm control panel in clear/transparent, protective envelope attached to inside of central panel door.

F. Provide nameplate on inside of each panelboard and main indicating color code scheme for the voltage of that panelboard and main, nameplates to be red with white characters.

2.02 WIRE MARKERS

A. Description: Tape or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters switchboard gutters, motor control center gutters, pull boxes, outlet and junction boxes, disconnect switches, motor starters, and at each load connection.

C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using No. 4 round heat cadmium plated, steel self-tapping screws or nickel-plated brass plates.

C. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

D. All fire alarm junction boxes and pullboxes shall be painted red where concealed or exposed in mechanical or electrical rooms.

E. Both ends of pullwires shall be identified by means of labels or tags, reading "PULLWIRE" and shall be numbered to refer to same pullwire.

F. Install nameplates at each circuit breaker on all switchboards and large panelboards.

G. Install wire markers on wires in each junction box, panelboard, switchboard, control panel, etc.

H. Install typewritten ”COMPUTER” with black letters and clear background on each coverplate of receptacles adjacent to information outlets

I. Install nameplates at each device within motor control centers.

J. Install directory of addresses and corresponding devices and locations in each addressable fire alarm and security control panels.

K. All security junction boxes and pullboxes shall be painted yellow where concealed or exposed in mechanical or electrical rooms.

L. Install labels on all telephone and computer cables.

M. All telephone junction boxes and pullboxes shall be painted white where concealed or exposed in mechanical or electrical rooms.

N. Paint all data junction boxes and pullboxes blue where concealed or exposed in mechanical or electrical rooms.

O. Paint all public address junction boxes and pullboxes dark gray where concealed or exposed in mechanical or electrical rooms.

P. Paint all television cable junction boxes or pullboxes black where concealed or exposed in mechanical or electrical rooms.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Occupancy Sensors.

D. Device plates.

1.02 RELATED SECTIONS

A. Section 26 0533 - Boxes.

B. Section 26 0553 - Electrical Identification: Labels on computer outlets.

1.03 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. UL 20 - General Use Snap Switches.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 894 - Switches for Use in Hazardous (Classified) Locations.

F. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.04 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:
   1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
   2. Include instructions for storage, handling, protection, examination, preparation, operation, and installation of product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 EXTRA MATERIALS

A. Provide protective rings and split nozzles as required and as specified.

PART 2 PRODUCTS (NO SUBSTITUTIONS)

2.01 WALL SWITCHES

A. Single Pole Switch:
   1. Hubbell #1221.
   2. Pass & Seymour #20AC1.
   3. Cooper Wiring Devices #2221.
   4. Leviton #1221.

B. Double Pole Switch:
   1. Hubbell #1222.
   2. Pass & Seymour #20AC2.
   3. Cooper Wiring Devices #2222.
   4. Leviton #1222.

C. Three-way Switch:
   1. Hubbell #1223.
   2. Pass & Seymour #20AC3.
   3. Cooper Wiring Devices #2223.
   4. Leviton #1223.

D. Four-way Switch:
   1. Hubbell #1224.
   2. Pass & Seymour #20AC4.
   3. Cooper Wiring Devices #2224.
   4. Leviton #1224.

2.02 RECEPTACLES

A. Single Convenience Receptacle:
   1. Hubbell #5361.
   2. Pass & Seymour #5361.
   3. Cooper Wiring Devices #5361.
   4. Leviton #5361.

B. Duplex Convenience Receptacle:
   1. Hubbell #5362.
   2. Pass & Seymour #5362.
   3. Cooper Wiring Devices #5362.
   4. Leviton #5362.

C. GFCI Receptacle:
   1. Hubbell #GF5352.
   2. Pass & Seymour #2091.
   3. Cooper Wiring Devices #XGF20.
   4. Leviton #GF5352.

D. Special Purpose Receptacle:
   1. Type, NEMA configuration and voltage as specified on Drawings as manufactured by:
      a. Hubbell.
      b. Pass & Seymour.
      c. Cooper Wiring Devices.
      d. Leviton.

E. Color of devices as selected by Architect/Engineer.

2.03 OCCUPANCY SENSORS

A. APPROVED MANUFACTURES
   1. Hubbell
   2. WattStopper
   3. Sensor Switch
   4. Engineer Approved

B. TYPE: Sensors shall be “Dual Technology” unless otherwise noted on plans

C. INSTALLATION
   1. The Occupancy Sensor system shall sense the presence of human activity within the desired space and fully control the “On” / “Off” function of the lights.
   2. Time Delay settings shall be set at 10 minutes. This delay selection is based on lamp life

vs. energy savings and sensor performance. Corridors and Bathroom time delay shall be set for 30 minutes to provide safety in such areas.

3. Contractor shall adjust sensor sensitivity so the device will operate properly.
4. Manufacture specified on drawings is specific to design. If an alternate manufacture is selected, the contractor is responsible for additional sensors, power pack, and additional equipment to meet the design needs. Also, contractor is to provide manufactures drawings with sensor coverage located on drawings. The revised drawing shall be included with the shop drawings. Alternate plan will only be approved once the engineer has reviewed this information.

2.04 WALL PLATES

A. Cover Plates: Stainless steel.

B. Weatherproof Enclosures:
   1. Receptacles in wet locations shall be installed with an outlet enclosure clearly marked "Suitable for Wet Locations While in Use". There shall be a gasket between the enclosure and the mounting surface, and between the cover and the base to assure proper seal.
   2. The enclosure must employ stainless steel mounting hardware and be constructed of impact resistant polycarbonate. The outlet enclosure shall be UL listed and shall be as manufactured by TayMac Corporation, or approved equal.

C. Wall-mounted Occupancy Sensors: Coverplates shall be suitable for sensor type and shape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

E. Verify color of all devices and coverplates.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install single and double pole switches with OFF position down.

D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

E. Install plates on switch, receptacle, and blank outlets in all areas.

F. Connect wiring devices by wrapping conductor around screw terminal in clockwise direction and tightening screw. Where wiring device has two (2) plates tightened by a screw, this method may be used. However, other back-connected wiring devices, which depend upon a metal spring action, are not allowed.

G. Use jumbo size plates for outlets installed in masonry walls.

H. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings, and on surface mounted outlets.

I. All plates shall be secured by means of screws with heads matching plates.

J. Vertically mounted receptacles shall be installed with equipment grounds down, unless local codes require otherwise. Horizontally mounted receptacles shall be installed with equipment grounds to the right, unless local codes require otherwise. Regardless, all receptacles, including GFCI receptacles, shall be installed in the same way with the ground, turned in the same direction.

K. Install labels on computer outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 0533 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switches 48 inches above finished floor to the center of the box.

C. Install convenience receptacle 18 (vertically oriented) inches above finished floor unless noted otherwise on Drawings.

D. Install convenience receptacle 6 (horizontally oriented) inches above finished counter.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

F. Check tightness of all conductor connections.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 26 2816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fusible switches.

B. Non-fusible switches.

C. Fuses.

D. Enclosed circuit breakers.

1.02 REFERENCES

A. ASME A17.1 - Safety Code for Elevators and Escalators.

B. NECA (National Electrical Contractors Association) “Standard of Installation”.

C. NEMA AB 1 - Molded-Case Circuit Breakers.

D. NEMA KS 1 - Enclosed Switches.

E. NFPA 70 - National Electrical Code.

F. UL 50 - Enclosures for Electrical Equipment.

G. UL 98 - Enclosed and Dead-Front Switches.

H. UL 198C - High Interrupting Capacity Fuses; Current Limiting Type.

I. UL 198E - Class R fuses.

J. UL 363 - Knife Switches.

K. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.

L. UL 1066 - Low Voltage AC and DC Power Circuit Breakers Used in Enclosures.

M. UL 1332 - Organic Coatings for Steel for Outdoor-Use Electrical Equipment Enclosure.

1.03 RELATED SECTIONS

A. Section 09 900 - Painting: Touchup.

B. Section 26 0529 – Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

1.04 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 0500.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Disconnect switches shall be heavy duty, as manufactured by,
   1. Square D
   2. Siemens ITE
   3. Cutler-Hammer

2.02 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch, with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.

B. Non-fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

2.03 ENCLOSED CIRCUIT BREAKERS

A. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R, lockable.

B. Minimum integrated short circuit rating as indicated on the Drawings shall be fully rated rating. Series-Rated equipment will not be accepted.

C. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

D. Cabinet: Finish in manufacturer's standard gray enamel.

E. 480Y277 volt main circuit breakers rated 1000 amperes or more shall have ground fault protection.

2.04 FUSES

A. Manufacturers:
   1. Bussman.
   2. Gould-Shawmut.
   3. Little.

B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1.

C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the electrical device where indicated.

B. Install fuses in fusible disconnect switches.

C. Install equipment ground bus in enclosed circuit breaker / switch.

D. Provide adhesive label on inside door of each switch indicating UL fuse class and size for

replacement.

E. Provide label on outside cover as directed by Section 26 0553 - Identification for Electrical Systems.

F. Provide three (3) spare fuses of each type utilized.

G. Bolt enclosed circuit breaker / switch to mounting surface in accordance with Section 26 0529.

H. Where wall-mounted circuit breaker / switches are mounted to be operated from floor or grade, install switch with middle of switch at 48 inches, if switch is less than 6'-6" tall. If switch is taller than 6'-6" tall, install switch with top of switch at 7'-6".

I. When the electrical devices are installed on exterior basement walls or outside, the switches shall be mounted on 1-1/2-inch channels.

J. Enclosed switches for wall-mounted exhaust fans installed higher than 8’ from the floor, shall be installed high on the wall next to the exhaust fan.

K. Install nameplate on disconnect switch with designation of equipment being served by switch. If main switch, install “Main Disconnect” nameplate.

L. Touchup scratched or marred surfaces to match original finish.

M. Connect elevator battery lowering device to auxiliary contact of elevator disconnect switch.

N. Neatly form wires inside switches.

3.02 FIELD QUALITY CONTROL

A. Check tightness of conductor lugs using calibrated torque wrench.

END OF SECTION