SECURE WALKWAY
ARKANSAS STATE CAPITOL

500 WOODLANE STREET
LITTLE ROCK, AR 72201

PROJECT MANUAL

Architect

WER Architects
901 West Third Street
Little Rock, Arkansas 72201
(501) 374-5300

Civil/ Landscape Consultant

Development Consultants, Inc.
2200 North Rodney Parham Road, Suite 220
Little Rock, Arkansas 72212
(501) 221-7880

MEPF&S Consultant

Cromwell
1300 East 6th Street
Little Rock, Arkansas 72202
(501) 372-2900

General Contractor

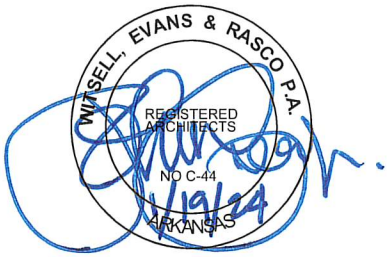
Kinco Constructors.
12600 Lawson Road
Little Rock, Arkansas 72210
(501) 225-1028

January 19, 2024
CAPTUN23.00

SECTION 00 0105
CERTIFICATIONS PAGE

ARCHITECT

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



NAME: JOHN GREER JR., AIA DATE: 01/19/2024 REG NO: C-44

END OF CERTIFICATIONS PAGE

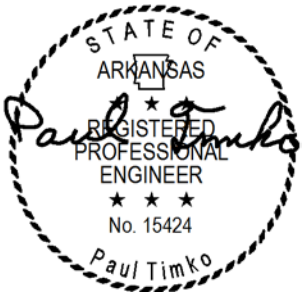
SECTION 00 01 05

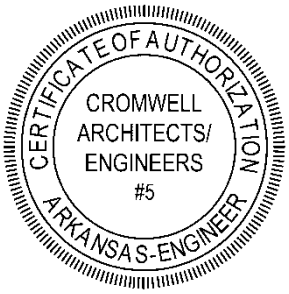
CERTIFICATIONS

I hereby certify that the structural portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Paul Timko, PE
Structural Engineer

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
1300 East 6th Street
Little Rock, Arkansas 72202



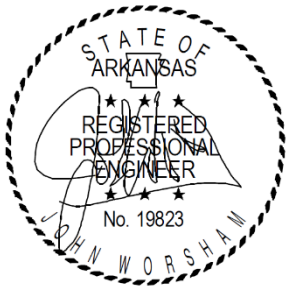


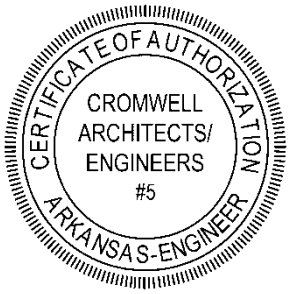
01-19-2024
Date

I hereby certify that fire protection portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

John Worsham, PE
Fire Protection Engineer

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
1300 East 6th Street
Little Rock, Arkansas 72202



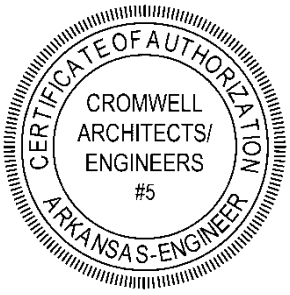


01-19-2024
Date

I hereby certify that the mechanical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Christopher R. Borné, PE
Mechanical Engineer

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
1300 East 6th Street
Little Rock, Arkansas 72202

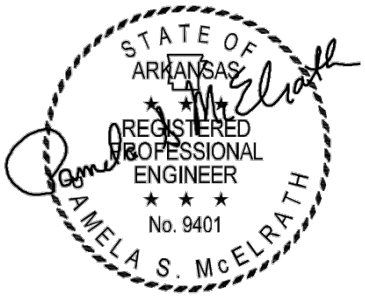


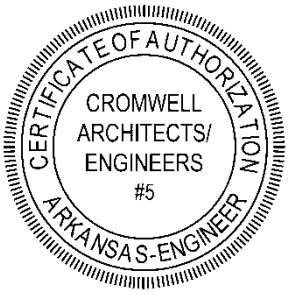
01-19-2024
Date

I hereby certify that the electrical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Pamela S. McElrath, PE
Electrical Engineer

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
1300 East 6th Street
Little Rock, Arkansas 72202





01-19-2024
Date

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NOT USED

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DIVISION 13 – SPECIAL CONSTRUCTION

NOT USED

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14 2100 ELECTRIC TRACTION ELEVATORS

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NOT USED

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SECTION 00 4905
OTHER CONTRACT FORMS

THE FOLLOWING FORMS ARE ATTACHED FOLLOWING THIS SECTION:

RESTRICTION OF BOYCOTT OF ISRAEL CERTIFICATION FORM

This is a mandatory requirement. Failure to certify may result in rejection of your proposal, and no award will be made to a vendor who has not so certified. If you have any questions, please contact the Purchasing Department.

CONTRACT AND GRANT DISCLOSURE CERTIFICATION FORM

This is a mandatory requirement. Failure to certify may result in rejection of your proposal, and no award will be made to a vendor who has not so certified. If you have any questions, please contact the Purchasing Department.

END OF SECTION

RESTRICTION OF BOYCOTT OF ISRAEL CERTIFICATION

Pursuant to Arkansas Code Annotated § 25-1-503, a public entity **shall not** enter into a contract valued at $1,000 or greater with a company unless the contract includes a written certification that the person or company is not currently engaged in, and agrees for the duration of the contract not to engage in, a boycott of Israel.

By signing below, the Contractor agrees and certifies that they do not boycott Israel and will not boycott Israel during the remaining aggregate term of the contract.

If a company does boycott Israel, see Arkansas Code Annotated § 25-1-503.

Bid Number/Contract Number	
Description of product or service	
Contractor name	

Contractor Signature: _____ Date: _____

Signature must be hand written, in ink

CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency.

SUBCONTRACTOR: **SUBCONTRACTOR NAME:**

☐ **Yes** ☒ **No**

TAXPAYER ID NAME: Witsell Evans & Rasco, P.A.

IS THIS FOR: ☐ **Goods?** ☒ **Services?** ☐ **Both?**

YOUR LAST NAME: Sargent **FIRST NAME:** David **M.I.:** W

ADDRESS: 901 West Third Street

CITY: Little Rock **STATE:** AR **ZIP CODE:** 72201 **COUNTRY:** USA

AS A CONDITION OF OBTAINING, EXTENDING, AMENDING, OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED:

FOR INDIVIDUALS*

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse *is* a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

Position Held	Mark (√)		Name of Position of Job Held [senator, representative, name of board/ commission, data entry, etc.]	For How Long?		What is the person(s) name and how are they related to you? [i.e., Jane Q. Public, spouse, John Q. Public, Jr., child, etc.]	
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly	☐	☐					
Constitutional Officer	☐	☐					
State Board or Commission Member	☐	☐					
State Employee	☐	☐					

☒ **None of the above applies**

FOR AN ENTITY (BUSINESS)*

Indicate below if any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

Position Held	Mark (√)		Name of Position of Job Held [senator, representative, name of board/commission, data entry, etc.]	For How Long?		What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control?		
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)	Position of Control
General Assembly	☐	☐						
Constitutional Officer	☐	☐						
State Board or Commission Member	☐	☐						
State Employee	☐	☐						

☒ **None of the above applies**

Contract and Grant Disclosure and Certification Form

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

As an additional condition of obtaining, extending, amending, or renewing a contract with a *state agency* I agree as follows:

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.

2. I will include the following language as a part of any agreement with a subcontractor:

   Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

I certify under penalty of perjury, to the best of my knowledge and belief, all of the above information is true and correct and that I agree to the subcontractor disclosure conditions stated herein.

Signature_____ Title_____ Date_____

Vendor Contact Person David W. Sargent, AIA Title CEO Phone No. 501-374-5300

Agency use only

Agency Number_____ Agency Name_____ Agency Contact Person_____ Contact Phone No._____ Contract or Grant No._____

Reset Form Print Form

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 THE AIA A101 - 2017 STANDARD AGREEMENT WILL BE USED AS THE BASIS OF THE FORM OF AGREEMENT FOR THIS PROJECT. COPIES OF THIS STANDARD DOCUMENT ARE AVAILABE AT SOUTHERN REPROGRAPHICS OR WER ARCHITECTS IF DESIRED OR NEEDED PRIOR TO BID DATE.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF AGREEMENT

SECTION 00 6000
PERFORMANCE BOND AND PAYMENT BOND

V.20

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

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

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

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

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

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

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

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

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

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

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

BY:_____

_____

CONTRACTOR DATE

BY:_____

_____

AGENT/ATTORNEY-IN-FACT DATE

(IN ACCORDANCE WITH ARK. CODE ANN. §22-9-402(B))

_____

AGENT DATE

_____

ADDRESS

_____

CITY COUNTY STATE ZIP CODE

BUSINESS PHONE:_____

FAX:_____

MAIL:_____

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

PERFORMANCE AND PAYMENT BOND

AMENDMENT #___

We, _____hereinafter referred to as Principal, and _____hereinafter referred to as Surety, have entered into an agreement entitled "Performance and Payment Bond", with the Secretary of State as obligee hereinafter after known as Owner Agency. Futhermore, we agree that said bond agreement, which was filed in the county of _____on the _____day of _____, 20__ and this amendment #____ is hereby incorporated into said bond agreement and any previous amendments(s) therein. This amendment shall be upon the same terms and conditions as set forth in the Bond Agreement, including any amendments, except the Agreement shall be amended and modified as follows:

1. The total aggregate amount for the Bond Agreement shall be $_____ dollars. This amended amount reflects those costs, time for completion and other terms of the Contract associated with said bond agreement and Change Order(s) #_____ for the project contract entered into between Principal and Owner Agency.

2. This Performance and Payment Bond Agreement Amendment is binding upon the above named parties, and their successors, heirs, assigns and personal representatives. The Bond Agreement as hereby extended, amended and modified is hereby ratified and confirmed by the parties who individually represent that each has the authority to enter into this amended agreement.

BY:_____

CONTRACTOR DATE

BY:_____

ARKANSAS RESIDENT LOCAL AGENT/ATTORNEY-IN-FACT DATE

(in accordance with Arkansas Code Annotated §22-9-402(b)(1)(2))

_____

AGENT DATE

_____

ADDRESS BUSINESS PHONE/FAX #

_____

CITY COUNTY STATE ZIP CODE

ARKANSAS STATUTORY PERFORMANCE AND PAYMENT BOND AMENDMENT IS THE ONLY BOND AMENDMENT FORM THE OWNER WILL ACCEPT.

END OF SECTION

SECTION 00 6110
CONSENT OF SURETY

FORM OF GENERAL CONDITIONS

AIA DOCUMENT G707-1994 - CONSENT OF SURETY APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*
Arkansas State Capitol Secured Walkway
Little Rock, AR

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction

CONTRACT DATED: September 05, 2023

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

TO OWNER: *(Name and address)*
Secretary of State
Arkansas State Capitol
500 Woodlane, Suite 12
Little Rock, AR 72201

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)

Kinco Constructors, LLC
12600 Lawson Road
Little Rock, AR 72210

Arkansas License # 0090280415

, 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)

Secretary of State
Arkansas State Capitol
500 Woodlane, Suite 12
Little Rock, AR 72201

, 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)

SECTION 00 6120
RELEASE OF LIENS

FORM OF GENERAL CONDITIONS

AIA DOCUMENT G706A-1994 - RELEASE OF LIENS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION

AIA® Document G706®A – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*
Arkansas State Capitol Secured Walkway
Little Rock, AR

TO OWNER: *(Name and address)*

Secretary of State
Arkansas State Capitol
500 Woodlane, Suite 12
Little Rock, AR 72201

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction
CONTRACT DATED: September 05, 2023

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)*
Kinco Constructors, LLC
12600 Lawson Road
Little Rock, AR 72210

Arkansas License # 0090280415

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

SECTION 00 6325
SUBSTITUTION REQUEST FORM

V.20 SEND TO:

WER ARCHITECTS / PLANNERS ATTN: MASON ELLIS

901 W. 3RD STREET

LITTLE ROCK, AR 72201

PHONE: 501-374-5300 FAX: 501-374-5247

SECTION:_____PARAGRAPH:_____SPECIFIED ITEM:_____

PROPOSED SUBSTITUTE:_____

ATTACH, COMPLETE DESCRIPTION, DESIGNATION, CATALOG OR MODEL NUMBER, SPEC DATA SHEET, AND OTHER TECHNICAL DATA, INCLUDING LABORATORY TESTS IF APPLICABLE.

ANSWER THE FOLLOWING QUESTIONS:

WILL SUBSTITUTION AFFECT DIMENSIONS INDICATED ON DRAWINGS? IS THE SIZE DIFFERENT PHYSICAL SIZE? _____

WILL SUBSTITUTION AFFECT WIRING, PIPING, DUCTWORK, ETC. INDICATED ON DRAWINGS? THIS INCLUDES LOWER OR HIGHER ELECTRICAL LOAD AND/OR VOLTAGE; DIFFERENT BTU HEAT LOAD AND/OR OR VENTING; REQUIRED CLEARANCES, ETC.

_____

WHAT AFFECT WILL SUBSTITUTION HAVE ON OTHER TRADES?

_____

LIST ANY DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM:

_____

IF NECESSARY, WILL THE UNDERSIGNED PAY FOR ARCHITECTS/ENGINEER'S COSTS, REQUIRED TO REVISE WORKING DRAWINGS, THAT ARE CAUSED BY SUBSTITUTION?

_____

MANUFACTURER'S WARRANTY OF PROPOSED ITEMS ARE [ ] SAME [ ] DIFFERENT

PROPOSED COST SAVINGS USING SUBSTITUTION PRODUCT:_____

REVIEW COMMENTS:

[ ] APPROVED

[ ] APPROVED AS NOTED (SEE ATTACHED EXPLAINATION)

[ ] NOT APPROVED / REJECTED

[ ] REJECTED / RECEIVED TOO LATE / NOT REVIEWED

REMARKS: _____REVIEWED BY: _____

SUBMITTED BY:

FIRM: _____

ADDRESS: _____

SIGNATURE: _____

DATE: _____

PHONE/EMAIL: _____

END OF SECTION

SECTION 00 7200
GENERAL CONDITIONS

V.20 FORM OF GENERAL CONDITIONS

1.01 THE AIA A201-2007 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

RELATED REQUIREMENTS

2.01 SECTION 00 7300 - SUPPLEMENTARY GENERAL CONDITIONS.

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Arkansas State Capitol Secured Walkway
Little Rock, AR

THE OWNER:
(Name, legal status and address)

Secretary of State
Arkansas State Capitol
500 Woodlane, Suite 12
Little Rock, AR 72201

THE ARCHITECT:
(Name, legal status and address)

Witsell Evans Rasco, P.A.
901 West Third St.
Little Rock, AR 72204

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.

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.

Additions and Deletions Report for

AIA® Document A201® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 10:04:47 CT on 10/12/2023.

PAGE 1

Arkansas State Capitol Secured Walkway
Little Rock, AR

...

Secretary of State
Arkansas State Capitol
500 Woodlane, Suite 12
Little Rock, AR 72201

...

Witsell Evans Rasco, P.A.
901 West Third St.
Little Rock, AR 72204

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, John Greer Jr., AIA, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 10:04:47 CT on 10/12/2023 under Order No. 3104239285 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 7300
SUPPLEMENTARY GENERAL CONDITIONS

PART 1 GENERAL V.20

1.01 SUMMARY

A. 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 GENERAL CONDITIONS

SUPPLEMENTARY GENERAL CONDITIONS: THE FOLLOWING SUPPLEMENTS MODIFY THE "GENERAL CONDITION OF THE CONTRACT FOR CONSTRUCTION", AIA DOCUMENT A201. WHERE A PORTION OF THE GENERAL CONDITIONS IS MODIFIED OR DELETED BY THESE SUPPLEMENTARY CONDITIONS, THE UNALTERED PORTIONS OF THE GENERAL CONDITIONS SHALL REMAIN IN EFFECT.

3.8.1 In line 1 after "Documents." add "Refer to Section 01 2100."

3.8.2.2 Add the following to end of clause, "except when installation is specified as part of the allowance. "Refer to Section 01 2100."

3.9.3 Add the following sentence at the end of the paragraph, "In event the approved superintendent must be changed for circumstances beyond the G.C.'s control, or at the direction of the Owner, the replacement superintendent must meet with the Owner's approval.

3.10 Add the following new subparagraph:

"3.10.4 Submit construction schedules in accordance with Section 01 3216."

3.11 At end of paragraph, add "Submit in accordance with Section 01 7000."

3.12.5 At end of subparagraph, add "Submit in accordance with Section 01 3000."

7.3.7 Lines 4 through 5, delete "reasonable...profit." and insert "an allowance for overhead and profit in accordance with the schedule set forth in subparagraph 7.3.11.

7.3 Add new subparagraph as follows:

"7.3.11 In subparagraph 7.3.7, the allowance for overhead and profit included in the total cost to the Owner shall be based on the following schedule:

1. For the contractor, for work performed by the Contractor's own forces, 12 percent of the cost.
2. For the contractor, for work performed by his subcontractor, 5 percent of the amount due the subcontractor.
3. For each subcontractor or sub-subcontractor involved, for work performed by that subcontractor's or sub-subcontractor's own forces, 12 percent of the cost.
4. For each subcontractor, for work performed by the subcontractor's sub-subscontractos, 5% of the amount due the sub-subcontractor.
5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.
6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major costs items are subcontracts, they shall be itemized also."

8.3 Add the following subparagraphs:

"8.3.4 The construction completion dates agreed on include an allowance for calendar days per month which may not be available for construction out-of-doors (normal inclement weather).

8.3.4.1 Contract time will not be extended due to normal inclement weather unless the Contractor can substantiate, to safisfaction of Architect, that greater-than-normal inclement weather occured, considering the full term of contract time, using averaged accumulated record

mean values from climatological data compiled by National Weather Service for the project locale, and that alleged greater-than-normal inclement weather actually delayed Work or portions of Work.

8.3.4.1.1 The measure of extreme weather shall be the number of days in excess of those stated for each month, in which precipitation exceeded 0.10 inch, from area weather station for same period of time, which is same source of data used to determine normal weather losses.

8.3.4.1.2 If total accumulated number of calendar days lost to weather exceeds total accumulated number expected for same period from inclement weather table, time for completion will be extended by number of calendar days needed to include excess number of calendar days lost.

8.3.4.2 Contract time will not be extended due to weather occurring after building is enclosed. "Enclosed" is defined to mean when building is sufficiently sealed, either temporarily or permanently, to permit structure to be heated and roof completed in order to permit drywall trades to work. The Architect shall determine when structure is "enclosed", and shall issue a letter to Owner, with a copy to Contractor, stating date building became "enclosed".

8.3.4.3 No change in contract sum will be authorized because of contract time due to weather."

9.2 At end of paragraph, add "Submit in accordance with Section 01 3000."

9.3.1:

7. At end of subparagraph, add "Submit in accordance with Section 01 3000."
8. Add new clause as follows:
   "9.3.1.3 Until Substantial Completion of the Work, 5% of each progress payment will be retained. Refer to Article 9.8.3 for adjustment in retainage upon Substantial Completion of Work.

9.10.2 At end of subparagraph, add "Submit affidavit of payment of debts and claims and affidavit of release of liens on AIA Forms G706 and G706A, respectively."

11.1.1 Add the following new clauses:

"11.1.1.9 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

9. Premises Operations (including X, C and U coverages as applicable).
10. Independent Contractor's Protective.
11. Products and Completed Operations.
12. Personal Injury Liability with Employment Exclusion deleted.
13. Contractural, including specified provision for Contractor's obligation under Paragraph 3.18.
14. Owner, non-owned and hired motor vehicles.
15. Broad Form Property Damage including Completed Operations."

11.1.2 Add new clause as follows:

"11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

16. Worker's Compensation Statutory
    Employer's Liability $100,000 per accident,
    - $500,000 Disease Policy Limit
    - $100,000 Disease, Each Employee
17. Commercial General Liability
    (including Premises-Operations,
    Independent Contractors'
    Protective, Products and Completed
    Operations, Broad Form Property Damage)
    a. Bodily Injury & $1,000,000 each occurence
       Property Damage Combined $2,000,000 aggregate

b. Products and Completed Operations to be maintained for 2 year after final Payment. $2,000,000 aggregate

c. Property Damage Liability Insurance will provide X, C, or U Coverage.

d. Broad Form Property Damage Coverage shall inslude Completed Operations.

18. Contractual Liability
    a. Bodily Injury & Property Damage Combined $1,000,000 each occurence $2,000,000 aggregate
19. Personal Injury, with Employment Exclusion deleted $2,000,000 aggregate
20. Business Auto Liability (including owned, non-owned and hired vehicles)
    a. Bodily Injury & Property Damage Combined $1,000,000 each occurence $2,000,000 aggregate
21. If the General Liability coverages are provided by a Commercial Liability policy, the:
    a. General Aggregate shall be not less than $2,000,000 and it shall apply, in total, to this Project only.
    b. Fire Damage Limit shall be not less than $50,000 on any one Fire.
    c. Medical Expense Limit shall be not less than $2,500 on any one person.
22. Umbrella Excess Liability
    - $1,000,000 over primary insurance
    - $10,000 retention for self-insured
    - hazards, each occurrence

11.1.3 Add the following new clause as follows:
"11.1.3.1 The Contractor shall furnish 3 copies of each Certificate of Insurance herein required which shall specifically set forth evidence of all coveraage required. Use ACORD certificate, 25-S, completed and supplemented in accordance with AIA Document A715."

11.2.1 In line 1 change "Owner" to "Contractor" and insert the following:
"The Contractor shall purchase and maintain insurance, in same amounts as specified in 11.1.2.1 above, covering the Owner's contingent liability for claims which may arise from operations under the Contract. The term "Owner", shall be deemed to include the Owner's employees, the Architect, and the Architect's employees and consultants."

11.3.1 ADD the following sentences:
"The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto."

11.3.1.3 Delete in its entirety.

11.3.4 Delete in its entirety.

11.4.1 Delete in its entirety and substitute the following:
"11.4.1 Contractor shall bond covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds must be issued by a Surety licensed to do work in Arkansas. Cost shall be included in the Contract Sum. The amount of bond shall be equal to 100 percent of the Contract Sum.
11.4.1.1 The Contractor shall deliver the required bonds to the Owner not less than three days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished."
11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bond on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

11.4.1.3 File a copy of the bond with Circuit Clerk in the county in which project is located.

12.2.2 Add the following to the subparagraph:

"12.2.2.1 Provide for and arrange a one year inspection of facilities before warranties expire, by Contractor, Architect/Engineer, and Owner. Inspection to occur before the end of the eleventh month from the date of substantial completion"

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Type of Contract.
   3. Work phases.
   4. Work under other contracts.
   5. Products ordered in advance.
   6. Owner-furnished products.
   7. Use of premises.
   8. Owner's occupancy requirements.
   9. Work restrictions.
   10. Specification formats and conventions.

B. Related Sections include the following:
   1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Arkansas State Capitol - Secured Walkway.
   1. Project Location: 500 Woodlane St, Little Rock, AR 72201

B. Owner: Secretary of State & Bureau of Legislative Affairs.

C. Architect: WER, 901 W. Third, Little Rock, AR 72201

D. The Work consists of the following:
   1. The Work includes installation of a secured walkway

1.04 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.05 WORK SEQUENCE

A. The work shall be executed as required to cause the least amount of disruption to daily operations.

B. The work shall be substantially complete on or before January 6th 2025.

1.06 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy of Project site.
   2. Driveways and Entrances: Keep driveways, parking, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.07 OWNER'S OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy site and building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.08 WORK RESTRICTIONS

A. On-Site Work Hours: Any work performed inside the existing building will be during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
   1. Contractor shall submit schedule and gain the Architect's written approval at least 72 hours before proceeding with any work during Government Unoccupied Hours.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than three days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

1.09 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 42-division format and CSI/CSC's "MasterFormat" numbering system.
   1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
   2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 1400
WORK RESTRICTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 CONTRACTOR USE OF PREMISES

A. The Architect's Representative will conduct a pre-construction survey with the Contractor to review and document the existing conditions surrounding the project premises prior to the beginning of any construction activity.

B. During the construction period, the Contractor shall have limited use of the premises for construction operations, including limited use of the site, limited by the Government's right to perform daily operations in the building and on the grounds.

C. The Contractor shall limit use of the premises to the work in areas indicated, to allow for Government occupancy and public use.
   1. Confine operations at the site to areas indicated. Do not disturb portions of the site beyond the areas in which Work is indicated.
   2. Keep driveways and entrances serving the premises clear and available at all times to the Government, Government employees and visitors. Do not use these areas for parking or storage of materials.
   3. Schedule deliveries to minimize space and time requirements for storage of material and equipment on site.
   4. Maintain existing building in a safe and weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take precautions to protect the building, its occupants and the public during the construction period.
   5. Keep public areas free from accumulation of waste material, rubbish, construction debris and construction materials.
   6. Space on the premises will be made available for the Contractor's storage and related activities, provided that its use will not interfere with operations of the Government. Arrange and gain approval for use of this space through the Architect.
   7. Use of the existing loading dock facilities will be shared with Government activities on a first-come-first-served, wait-your-turn basis.
   8. Existing materials and equipment that are removed as part of the construction operations, and that are not reused or are not designated to be salvaged as Government or other's property, shall become the property of the Contractor and shall be removed from the site. Storage or sale of excess salvageable materials and equipment is not permitted on site.
   9. Pollution producing equipment shall not be located near air intakes where airborne smoke or fumes could be drawn into the building.
   10. The Contractor and Contractor's employees shall make their own arrangements for vehicle parking off site, unless otherwise directed by the Architect's Representative.

1.03 GOVERNMENT OCCUPANCY

A. The Government will occupy the existing building during the entire period of construction. Cooperate with the Government's representatives during construction operations to minimize conflicts and facilitate Government usage. Perform the Work in a manner that does not interfere with the Government's operations.

1.04 WORKING HOURS

A. Government Occupied Hours: Government personnel are scheduled to occupy the building during the following hours on weekdays, Monday through Friday, except for established Government Holidays: 7:00 AM to 5:00 PM.

B. Contractor's General Working Hours: The Contractor working hours shall be generally established to occur during Government Occupied Hours.

C. Work accomplished during Government Unoccupied Hours shall be performed at no additional cost to the Government. Contractor shall submit a proposed schedule and gain the Architect's written approval at least 72 hours before proceeding with any work during Government Unoccupied Hours.

1.05 PART 2 PRODUCTS (NOT APPLICABLE)

1.06 PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

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

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

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

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

1.02 SCHEDULE OF VALUES

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

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

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

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

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

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

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

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

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

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

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

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

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

F. Execute certification by signature of authorized officer.

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

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

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

1.04 MODIFICATION PROCEDURES

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

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

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

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

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

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

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

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

I. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7800.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Cash allowances.

B. Inspecting and testing allowances.

C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

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

1.03 CASH ALLOWANCES

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

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

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

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

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

1.04 ALLOWANCES SCHEDULE

A. Signage: Include the stipulated sum of $1,000.00 for purchase, delivery, and installation of interior door code required ADA compliant signage.

B. Waterproofing: Include the stipulated sum of $5,000.00 for the investigation and repairs of water infiltration locations in the Capitol Basement at the North wall at locations where new furring walls are being installed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

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

1.02 RELATED REQUIREMENTS

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

1.03 ACCEPTANCE OF ALTERNATES

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

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

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Include wood veneer wall panels at bumpouts in secured walkway 100. See D10 A1.01 for locations and details.

B. Deductive Alternate No. 2 – Omit Curtain Wall for window unit CW-2 and replace with a front set thermally broken aluminum storefront system to match existing size and layout with a Bronze Finish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 6325 - Substitution Request Form: Required form for substitution requests made after award of contract (During construction).

B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. General Clarification: Where a definate material is specified it is not the intent to descriminate against any equal product from another manufacturer. It is the intent to set a definate standard. Open competition is expected, but in all cases, complete data must be submitted for comparrision and test when requested by Architect. No substitution shall be made unless authorized in writing by the Architect. If the Contractor proposes to substitute an equal product, he shall make this fact known, in writing, to the Architect as soon as possible after the award of the contract.

B. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system including aesthetics of physical properites such as available colors, patterns and textures.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms included in the Project Manual are adequate for this purpose, and must be used.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
   1. Submit substitution requests by completeing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
   2. Lighting Fixture Substitution- Lighting Fixtures not specifically listed in the Lighting Fixture Schedule by manufacturer indicated as approved to bid must be submitted 7 days prior to bid. Provide cut sheets labeled with the mark shown in the Lighting Fixture Schedule on E0.02. Provide lighting level calculations for review. Typical lighting levels for classrooms are acceptable. Architect will review for conformance with the Design Intent. Engineer will review for conformance with technical requirements.
   3. Plumbing Fixture Substitution- Plumbing Fixtures not specifically listed in the Plumbing Fixture Schedule by manufacturers indicated as approved to bid must be submitted 7 days prior to bid. Provide cut sheets labeled with the mark shown in the Plumbing Fixture Schedule.
   4. Mechanical Equipment Substitution- Mechanical Equipment not specifically lited in the Mechanical Equipment Schedules and specifically noted in the drawings by manufacturers indicated as approved to bid must be submitted 7 days prior to bid. Provide cut sheets labeled with the mark shown in the Mechanical Equipment Schedules. Architect will reivew for conformance with the Design Intent. Engineer will review for conformance with technical requirements.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 30 days after date of Agreement.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be recorded into submittal and any required changes to the Construction Documents will be incorporated into the work by issuance of Change Order, Architectural Supplementary Insructions, or similar instruments proivded for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Electronic document submittals.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Change Order requirements.

G. Contractor Liabiltity requirements.

H. Coordination drawings.

I. Submittals for review, information, and project closeout.

J. Number of copies of submittals.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

1.03 PROJECT COORDINATION

A. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for construction & delivery access, traffic, and parking facilities.

B. During construction, coordinate use of site and facilities through the Project Coordinator.

C. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

E. Coordinate field engineering and layout work under instructions of the Project Coordinator.

F. Make the following types of submittals to Architect:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.
   9. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTALS

A. Any documents transmitted for purposes of administration of the contract will be in electronic (PDF) format and transmitted via an Internet-based e-mail service.
   1. In addition to submittals for review, information, and closeout, this procedure will apply to requests for information (RFIs), progress documentation, contract modification documents

(e.g. supplementary instructions, proposal requests, change orders), applications for payment, field reports and meeting minutes, and any other document the Contractor or Architect wish to make part of the project electronic record.

2. Contractor and Architect will use conventional e-mail for this service, subject to the limitations of the service provider (file size).
3. It is the Contractor's responsibility to submit documents in PDF format via file attachment to e-mail directed to WER Architect. Addressee will be determined at the pre-construction conference. Documents shall be reviewed and stamped by the contractor prior to submission. PDF documents without contractors stamp, signature and/or initials, & date will not be reviewed. Each scan or PDF copy, especially large format documents or drawings, shall be individually stamped, if transmitted as individual files. Assembled documents in a single file need only be stamped once.
4. Subcontractors, suppliers, and Architect's consultants are required to use the e-mail transmission of review documents, and provide copies directed to the Architect and Contractor.
5. Users of the electronic document submission process shall provide an email address and Internet access. PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), is encouraged, unless scan to PDF file capability is provided by the document generator / provider.
6. Paper documents & transmittals of electronic submissions will not be reviewed; emailed PDF documents without transmittal letters / forms from the contractor will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to physical samples or color selection charts.

B. Cost: The cost of the electronic document submittal(s) is to be paid by Contractor; include the cost of the submittals in the contract sum.

C. Project Closeout: Architect will determine which project electronic document files shall be archived for the Owner. The contractor shall provide these documents elecronically and physical components as part of the close out document submission.

3.02 PRECONSTRUCTION MEETING

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

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Distribution of Contract Documents.
   2. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   3. Designation of personnel representing the parties to Contract, the Owner and Architect.
   4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   5. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.

3. Architect.
4. Contractor's Superintendent.
5. Major Subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements .
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Security and housekeeping procedures.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, 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 that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

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

E. Submit updated schedule with each Application for Payment.

3.06 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.07 DIGITAL DOCUMENT FILES AND RELEASES

A. BIM Models: Projects are created by Architect and Engineers using Building Information Modelling software and not all projects wil have these files available for Contractor's use. The final model is a composite of multiple models that will require separate models from consultants. Contact Architect and Engineers for specific availablity and cost.

B. AutoCAD files: Do not exist for architectural plans. Architect has capabilty to generate AutoCAD files that resemble the sheets as seen in the Construction Documents as well as generate entire floor plans of the building. This service can be provided at a cost to the Contractor per sheet/floor plan desired. See end of section for Digital Release form.

C. Portable Digital Format (PDF): PDF of issued drawings can be provided to Contractor at no cost. Contact Architect for availablity.

D. Other documents: Contractor will have to directly contact consultants for trade specific files, such as AutoCAD files for topographical layout, etc.

3.08 REQUESTS FOR CHANGE ORDERS

A. In order to facilitate checking of quotations for extras or credits, all proposals, except for those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materilas shall be itemized in manner prescribed above. Where major cost items are subcontracts, they shall be itemied also.

3.09 CONTRACTOR LIABILITY REQUIREMENTS

A. The Contractor shall cause the commerical liability coverage required by the Contract Documents to include (1) the Owner, the Architect Engineer and the Architect Engineer's consulants as additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caued in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations. The Architect / Engineer, Engineer, and their respective Consultants are responsible for their own Professional Liability coverage.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. Delgated Design Deferred submittals.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.

4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Documents for Information: Submit one electronic copy.

C. Documents for Project Closeout: Make electronic reproductions of submittal files originally reviewed. Include electronic files of any submittals for information. All hard copies of Operational Manuals included with products and equipment should be collected and retained for close out documentation.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates required for jobsite use & verification.
2. Retained samples will not be returned to Contractor unless specifically so stated. Digital documentation of approvided samples will be provided.

3.14 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form and Contractors transmittal form. Transmittal shall be numbered sequentially and revised submittals should include original number and a sequential alphabetic suffix. Transmittal shall include list of each specification section or sections that are included in the submittal contents. Send transmitted submittal as one complete PDF; multiple files will not be reviewed and will need to be reassembled by Contractor.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number.

C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Deliver physical submittals to Architect at business address. In some instances, larger physical samples can be coordinated to be delivered to the construction site, typically for use in a mock-up.

E. Schedule submittals to expedite the Project, and coordinate submission of related items. Transmit higher priority submittals first and provide date for anticipated return of submittal.

F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor. When large quantities of submittals are transmitted in a short time frame, review time may take longer. Mark high priority submittals on trasmittal to notify / assist in an expidited review.

G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work. Any proposed change or

deviation from Contract Document plans or specifications must be clearly noted and easily identifiable on the submittal. Any change must be identified and specifically requesting approval of proposed deviation by Architect or Engineer of Recod. Failure to follow this requirement results in submitted deviation bearing the complete responsiblity of the contractor.

H. Comments made in submittals by Architect or Engineer that change contract costs need to be submitted to Architect as a Potential Change Order for Claims for review and approval by Owner prior to the change to project scope. Failure to follow this requirement, whether a cost savings or cost increase, results in the submitted cost change bearing the complete responsibilty of the providing contractor.

I. Provide space for Contractor and Architect review stamps. Submittals must be reviewed and stamped by Contractor, unstamped submittals will be not be reviewed and will be returned.

J. Submittals to be as complete, comprehensive and accurate as possible. Include all components requested to be reviewed in Submittal section 1.03 of the specifications. Do not split up a single specification section into multiple submittals (ie product data, samples, shop drawings, etc.). Avoid grouping unrelated specifications sections together in a submittal.

K. Each submittals will only be reviewed two times; once for orginal review and then a second time for a potential revised submittal. Any further additional reviews must include General Contractor's explaination for their inablity to conform with requirements. Additional reviews beyond aforementioned may have costs associated to complete additional reviews.

L. When revised for resubmission, identify all changes made since previous submission. Cloud all changes and revised details / notes. Address all comments and/or questions posed in previous submission; lack of addressing all previous review comments are grounds for rejections of submittal. Include previous reviewed submittal pages after the last page of the new submittal information.

M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

N. Submittals not requested will not be recognized or processed.

3.15 AUTOCAD RELEASE FORM

A. At your request, Witsell Evans Rasco, P.A. (WER) will provide electronic files for your convenience and use in the preparation of a bid or shop drawings related to Project: Secure Walkway - Arkansas State Capitol subject to the following terms and conditions.

B. WER's electronic files are compatible with AutoCad as a dwg. file. WER makes no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

C. Data contained on these electronic files is part of WER's instruments of service and shall not be used by you or anyone else receiving this data through or from you for any purpose other than as a convenience in the preparation of bids or shop drawings for the referenced project. Any other use or reuse by you or by others, will be at your sole risk and without liability or legal exposure to WER. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against WER, its officers, directors, employees, agents or sub-consultants which may arise out of or in connection with your use of the electronic files.

D. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold harmless WER from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files.

E. **These electronic files are not contract documents.** Differences may exist between these electronic files and corresponding hard copy contract documents due to addenda, change orders or other revisions. WER makes no presentation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed contract documents prepared by WER and electronic files, the signed contract documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including and without limitations, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.

F. Because of the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, WER reserves the right to remove all indications of its ownership and/or involvement from each electronic display.

G. WER will furnish you electronic files at a cost of **$150.00** per building floor or sheet, for the following:

1. _____
2. _____
3. _____

A service fee of $ (_____) shall be remitted to WER prior to delivery of the electronic files.

H. Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by WER and WER makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall WER be liable for any loss of profit or any consequential damages.

SIGNED: _____ _____

WITSELL EVANS, RASCO PA **CONTRACTOR NAME / TITLE**

_____

_____

DATE: _____ **ADDRESS / PHONE NUMBER**

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

1.04 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

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

E. Submit updated schedule with each Application for Payment.

F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

1.05 QUALITY ASSURANCE

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

1.06 SCHEDULE FORMAT

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

B. Diagram Sheet Size: Maximum 22 x 17 inches or width required.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

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

3.02 CONTENT

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

B. Identify work of separate stages and other logically grouped activities.

C. Include conferences and meetings in schedule.

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

E. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.

F. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

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

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

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

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

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

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

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

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

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

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

F. Submit reports required to support recommended changes.

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

3.06 DISTRIBUTION OF SCHEDULE

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

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

END OF SECTION

SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Schedule" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on The Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

E. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Submittal number or other unique identifier, including revision identifier.
1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

F. Deviations: Highlight, or otherwise specifically identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use AIA Document G810.
2. Transmittal Form: Provide locations on form for the following information:
a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number.
k. Submittal and transmittal distribution record.
l. Remarks.
m. Signature of transmitter.
3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved by Architect."

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating "Approved by Architect" taken by Architect.

PART 2 PRODUCTS

2.01 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
   1. Submit electronic submittals directly to extranet specifically established for Project.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operation and maintenance manuals.
      k. Compliance with specified referenced standards.
      l. Testing by recognized testing agency.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.
   4. Submit Product Data before or concurrent with Samples.
   5. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Architect will return one copy. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. Shopwork manufacturing instructions.
      g. Templates and patterns.
      h. Schedules.
      i. Design calculations.
      j. Compliance with specified standards.
      k. Notation of coordination requirements.
      l. Notation of dimensions established by field measurement.
      m. Relationship to adjoining construction clearly indicated.

n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
4. Number of Copies: Submit three opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.

2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
    a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Schedule" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Schedule."

H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
    a. Mark up and retain one returned copy as a Project Record Document.

2.02 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Schedule."

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

L. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

U. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return them for resubmittal.

PART 3 EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Testing and inspection agencies and services.

D. Control of installation.

E. Mock-ups.

F. RELATED REQUIREMENTS
   1. Document 00 3100 - Available Project Information:
   2. Section 01 2100 - Allowances: Allowance for payment of testing services.
   3. Section 01 3000 - Administrative Requirements: Submittal procedures.
   4. Section 01 4216 - Definitions.
   5. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.02 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

1.03 SUBMITTALS

A. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

B. See Section 01 3000 - Administrative Requirements, for submittal procedures.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept

expressed in the Contract Documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Architect benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Testing and Inspection Agencies and Services
   1. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
   2. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
   3. Contractor Employed Agency:
      a. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
      b. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
      c. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 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 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. Have work performed 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, and disfigurement.

3.02 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 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 before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   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 by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with 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 4216
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Provide: To furnish and install.

E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4533

SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, may apply to this Section.

B. Section 014000 - Quality Requirements. Requirements for Contractor performed independent tests and inspections that are normally Contractor's responsibility and are not specifically indicated within the requirements of this section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Special Inspections and Tests.

B. Special inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Construction Document requirements.
   1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the construction document requirements.
   3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this section.

C. The Contractor shall engage one or more qualified special inspectors and / or testing agencies to conduct special inspections and tests specified in this section and related sections and as maybe specified in other divisions of these specifications.

D. Refer to Statement of Special Inspections and forms following the end of this section for the inspection and testing requirements and forms to be utilized by the Contractor and inspectors.

E. Related Sections include but are not limited to the following:
   1. 014000 - Quality Requirements
   2. 032000 - Concrete Reinforcing
   3. 033000 - Cast-in-Place Concrete
   4. 055000 - Metal Fabrications
   5. 055100 - Metal Stairs
   6. 055213 - Pipe and Tube Railings
   7. 210548 - Fire Suppression Vibration Isolation and Seismic Restraint
   8. 260529 - Hangers and Supports for Electrical Systems
   9. 31 2000 - Earth Moving

1.03 RELATED STANDARDS

A. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2021

B. ICC (IBC) - International Building Code; 2021

C. SEAoAR SI GL 03 - 01/01/2023; Arkansas Special Inspections Guidelines; www.SEAoAR.org.

D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2016

1.04 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, Ip, is greater than 1 in accordance with Section 13.1.3 of ASCE 7.

D. Registered Design Professional in Responsible Charge: The individual that prepares the Statement of Special Inspections including a Schedule of Special Inspection Services as part of the general requirements Section 1704 of the Building Code. The Registered Design Professional for special inspections is typically the project architect. The architect will take input from the structural, mechanical, electrical, civil and fire protection engineers and act as the overall Registered Design Professional in Responsible Charge of preparing the Statement of Special Inspections.

E. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

F. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

G. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

H. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

I. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E 329 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the Building Official for consideration before proceeding with work.
   2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.06 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the Contractor.

D. Where a conflict exists between the Construction Documents and approved shop drawings / submittal data, the Construction Documents shall govern, unless the approved shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the Registered Design Professional in Responsible Charge.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SPECIAL INSPECTOR (TESTING AGENCIES) RESPONSIBILITIES

A. The Special Inspectors shall:
   1. Provide written documentation to the Building Official demonstrating their qualifications.
   2. Notify the Contractor of their presence and responsibilities at the job site.
   3. Observe assigned work for which they are responsible for conformance with the plans and specifications and approved submittals for work designed by the Contractor.
   4. Report nonconforming items to the immediate attention of the Contractor for correction.
   5. Write a discrepancy report about each nonconforming item containing:
      a. Description and exact location.
      b. Reference to applicable drawings and specifications.
      c. Resolution or corrective action taken and the date.
   6. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and to the Registered Design Professional In Responsible Charge prior to the completion of that phase of the work.
   7. Provide special inspection reports directly to the Design Professional, the Contractor and the Building Official at the intervals indicated on the Statement of Special Inspections. The reports should:
      a. Describe the special inspection and tests made, with locations.
      b. Indicate nonconforming items and their resolution.
      c. List unresolved items and parties notified.
      d. Itemize any changes authorized by the Design Professional.
   8. Initial and date the "Date Completed" box in the Schedule of Special Inspection Services as the inspection and testing activities are completed.
   9. Submit a signed Final Report of Special Inspections stating that all required special inspections and testing were fulfilled and reported and that any outstanding discrepancies have been corrected.

3.02 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be familiar with Chapter 17 of the International Building Code.

B. The Contractor shall coordinate the inspection and testing services with the progress of the work. The Contractor shall provide sufficient notice to allow proper scheduling of all personnel. The Contractor shall provide safe access for performing inspection and on site testing.

C. The Contractor shall provide and maintain project schedules to the Owner, Registered Design Professionals and testing and inspecting agencies. Project schedules shall indicate milestones and durations of time for materials requiring structural tests and special inspections, including retesting or reinspections required.

D. Notify special inspectors 72 hours prior to expected time for operations requiring testing/inspection services.

E. Provide Special Inspectors direct access to the approved plans and specifications for the project, including modifications.

F. Deliver samples for testing when needed.

G. Cooperate with special inspectors, and provide access to the Work .

H. Provide incidental labor and facilities:
   1. To provide access to Work to be tested/inspected.
   2. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   3. To facilitate tests/inspections.
   4. To provide storage and curing of test samples.

I. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.

J. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.

K. Maintain the Schedule of Special Inspection Services at the project site and submit a copy to the Design Professional and the Building Official when all the services are complete.

L. The Contractor shall submit certification as an Approved Fabricator prior to any shop fabrication of load-bearing members and assemblies, where the fabricator requests to perform such work without special inspection.

M. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections Requirements for Seismic Resistance shall submit a written Contractor’s Statement of Responsibility to the Building Official and to the Owner prior to the commencement of work on the system or component. The Contractor’s Statement of Responsibility shall contain the following:
   1. Acknowledgement of the awareness of the special requirements contained in the Statement of Special Inspections.
   2. Acknowledgement that control shall be exercised to obtain conformance with the construction documents approved by the Building Official.
   3. Procedures for exercising control within the Contractor’s organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

N. The Contractor shall repair and / or replace work that does not meet the requirements of the Construction Documents.
   1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
   2. Engineer / architect shall be registered in the State in which the Project is located. Engineer / architect shall be acceptable to the Registered Design Professional in Responsible Charge, Building Official, and Owner.
   3. Procedures shall be submitted for review and acceptance by the Registered Design Professional in Responsible Charge, Building Official, and Owner before proceeding with corrective action.

O. The Contractor shall be responsible for costs of:
   1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the Construction Documents and shop drawings / submittal data.
   2. Review of proposed repair and / or replacement procedures by the Registered Design Professional in Responsible Charge and the inspectors and testing agencies.
   3. Repair or replacement of work that does not meet the requirements of the Construction Documents.

P. The Contractor shall submit Certificates of Compliance and test reports in accordance with IBC Section 1704.5 to the Owner, Registered Design Professional in Responsible Charge and Building Official after completion of fabrication.

Q. The Contractor shall submit Manufacturer's Certificates of Compliance, specific to the project location, for all mechanical and electrical equipment indicated to be seismically qualified.

R. The Contractor shall maintain one copy of all required manufacturer's equipment Certificates of Compliance, for special inspector's use, at the jobsite.

S. The Contractor shall maintain one copy of all shop drawings indicating seismic restraint design for all designated seismic systems, for special inspector's use, at the jobsite.

3.03 INSPECTION AND TESTING

A. Inspection and Testing shall be in accordance with the attached Schedule of Special Inspection Services.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings and as required by reference standards indicated in IBC Chapter 17.

3.04 SCHEDULES AND FORMS (INCLUDED FOLLOWING THE END OF THIS SECTION)

A. STATEMENT OF SPECIAL INSPECTIONS.
   1. The Statement of Special Inspections is included as an attachment to this section. This form provides the general project information. It identifies the project location, the architect of record, the structural, mechanical, and electrical engineers, the Registered Design Professional in Responsible Charge, and Special Inspection Requirements for Seismic or Wind Resistance.
   2. The Contractor shall submit the Statement of Special Inspections with the application for the building permit and have the Building Official sign, date, and shall add the building permit number to the statement. The Contractor shall send a copy of the completed document to the Architect Engineer, Owner, Building Official, and keep a copy in the job site office.

B. SCHEDULE OF SPECIAL INSPECTION SERVICES.
   1. The Schedule of Special Inspection Services is included as an attachment to this section. This form provides a detailed and itemized list of which special inspection activities are required for the specific project and which individuals, firm, or agency will be performing the special inspection services associated with each required task.
   2. The Contractor shall maintain the schedule at the project site. When an individual special inspection task in the schedule is completed for the last time on the project and the special inspector performed their final review, inspection, or test of that item for the project, the special inspector shall initial and date the cell in the "Completed" column adjacent to the task. The schedule shall be maintained by the Contractor at the project site.
   3. At the conclusion of the project a copy of the Schedule of Special Inspection Services form with the initials and date in the "Completed" column for each task relevant to the project shall be submitted, by the Contractor, to the Design Professional in Responsible Charge and the Building Official for comparison with the Final Reports of Special Inspections.

C. FINAL REPORT OF SPECIAL INSPECTIONS.
   1. The form for the final report of Special Inspections is included as an attachment to this section. This form is submitted by each inspector when all the special inspection requirements they are responsible for on the project have been fulfilled and all noted deficiencies have been corrected. Each special inspector corresponding to an agent number in the Schedule of Special Inspection Services will be required to complete a copy of this form.
   2. The special inspectors shall provide 3 bound copies of the special inspection interim reports with the final report of special inspections serving as the cover sheet. The copies shall be submitted to the Design Professional in Responsible Charge and Building Official within 2 weeks of completion of the special inspection program. The special inspection program will not be considered complete until forms from all agents have been submitted and received.

D. CONTRACTOR'S STATEMENT OF RESPONSIBILITY.

1. The form for the Contractor's Statement of Responsibility is included as an attachment to this section.
2. Each contractor responsible for the construction or fabrication of a seismic force resisting system, designated seismic system or component, listed in the Statement of Special Inspections - Requirements for Seismic Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
3. Each contractor responsible for the construction or fabrication of a main wind force resisting system or a wind force resisting component listed in the Statement of Special Inspections - Requirements for Tornado Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
4. Contractor's Statements of Responsibility shall be submitted to the Design Professional in Responsible Charge for approval along with the design submittal for the associated work.

E. APPROVED FABRICATOR'S CERTIFICATE OF COMPLIANCE.
1. The form for the approved Fabricator's Certificate of Compliance is included as an attachment to this section.
2. Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per IBC Section 1704.2.5 must submit Fabricator's Certificate of Compliance at the completion of fabrication to the Contractor.
3. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Design Professional in Responsible Charge and the Building Official.

F. CERTIFICATES OF COMPLIANCE
1. These forms shall be completed by the fabricator or contractor responsible for each system or component and submitted to the owner, Design Professional and Building Official. These forms are included as an attachment to this section.
    a. Nonstructural Components Certificate of Compliance in accordance with IBC Section 1705.14.2
    b. Certificate of Compliance for Designated Seismic Systems in accordance with IBC Section 1705.14.3
    c. Preconstruction Tests for Shotcrete in accordance with ACI 318
    d. Steel Joist Fabricator’s Certificate of Compliance in accordance with IBC Section 2207.5
    e. Certificate of Compliance of Material Properties for Weldability of Reinforcement with a Standard Other than ASTM A706
    f. Certificate of Compliance for Reports of Mill Tests for A615 Reinforcement Used in Seismic Force-Resisting Systems

G. MINIMUM SPECIAL INSPECTOR QUALIFICATIONS.
1. This document is included as an attachment to this section.
2. This document lists the Structural Engineers Association of Arkansas (SEAoAR)'s recommended minimum qualifications for special inspectors.
3. The final approval of an inspector shall be determined by the building official.

H. OTHER SPECIAL INSPECTION REPORT AND NOTICE FORMS.
1. Forms for Special Inspection Reports and Discrepancy Notices are included as attachments to this section.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: Arkansas State Capitol Secure Walkway

LOCATION: Little Rock, AR

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

_____

ARCHITECT OF RECORD: John Greer

STRUCTURAL ENGINEER OF RECORD: Paul Timko

MECHANICAL ENGINEER OF RECORD: Chris Borne

ELECTRICAL ENGINEER OF RECORD: Pam McElrath

FIRE PROTECTION ENGINEER OF RECORD: John Worsham

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: John Greer

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2021 Arkansas Fire Prevention Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Tornado Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly X Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Preparer's Seal

_____
Type or print name

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:
__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

Statement of Special Inspections
Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements.

Seismic Design Category: C

Statement of Special Inspection for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Required for Seismic Design Categories B, C, D, E or F in accordance with Building Code Section 1705.13.1 through 1705.13.3, and 1705.14.1). Some systems not required in SDC B, see section 1705.13.

Ordinary Reinforced Concrete Shear Walls

Description of designated seismic systems subject to special inspection, testing and qualification for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with ASCE 7-16 Chapter 13, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F, in accordance with Building Code Section 1705.13.4 and 1705.14.3.)

Fire Protection Sprinkler System

Emergency Lighting and Exist Signs

Egress Stairs

Description of additional components and systems requiring special inspections, testing and qualification for seismic resistance:
(Required for systems noted in Building Code Sections 1705.13.5 through 1705.13.9 and 1705.14.2 1705.11).

NA

Statement of Responsibility:

Each contractor responsible for the construction or fabrication of a system or component described above must each submit a Statement of Responsibility (pg C1) in accordance with Building Code Section 1704.4.

SCHEDULE OF SPECIAL INSPECTION SERVICES				
MATERIAL / ACTIVITY	**SERVICE**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.2 Structural Steel Construction - Steel Stairs				
1. Review the material test reports and certificates as listed in AISC 360-16, Section N3.2 for compliance with the construction documents	Submittal review	Each submittal		
2. Material verification of structural steel	Shop (3) and field inspection	Periodic		
3. Anchor Rods and other Embedment(s) (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Continuous		
4. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Periodic		
5. Structural steel welding:				
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection	Observe or Perform as noted (4)		
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection	Observe (4)		
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection	Observe or Perform as noted (4)		
5) Fabricator's NDT reports when fabricator performs NDT	Verify reports	Each submittal (5)		
6. Structural steel bolting:	Shop (3) and field inspection			
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360-16, Table N5.6-1)		Observe or Perform as noted (4)		
b.Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360-16, Table N5.6-2)		Observe (4)		
1) Pre-tensioned and slip-critical joints		Periodic		
2) Snug-tight joints		Periodic		
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)		Perform (4)		
a. Placement and installation of steel headed stud anchors		Periodic		
1705.3 Concrete Construction				

SCHEDULE OF SPECIAL INSPECTION SERVICES				
MATERIAL / ACTIVITY	**SERVICE**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1. Inspection of reinforcement, including verify placement. Placement includes reinforcing bar size, shape, spacing, cover, embedment, orientation, bar length, and splices per the construction documents and approved placement drawings.	Field inspection	Periodic		
3. Inspection of anchors cast in concrete	Shop (3) and field inspection	Periodic		
4. Inspection of anchors and reinforcing steel post-installed in hardened concrete: Per research reports requirements	Field inspection	Periodic or as required by the research report issued by an approved source		
a. Adhesive anchors installed horizontally or in upwardly inclined orientations to resist sustained tension loads.	Field inspection	Continuous		
b. Mechanical anchors and adhesive anchors not defined in 4.a.	Field inspection	Periodic		
5. Verify use of approved design mix	Shop (3) and field inspection	Periodic		
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests and determine temperature of concrete	Shop (3) and field inspection	Continuous		
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Continuous		
8. Inspection for maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Periodic		
13. Verification of in-situ concrete strength, prior to removal of shores and forms from beams and structural slabs.	Field testing and review of laboratory reports	Periodic		
14. Inspection of formwork for shape, lines, location and dimensions	Field inspection	Periodic		
15. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Periodic		
1705.6 Soils				
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Periodic		
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Periodic		
3. Perform classification and testing of controlled fill materials.	Field inspection	Periodic		
4. During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities, and lift thicknesses during placement and compaction of compacted fill	Field inspection	Continuous		

SCHEDULE OF SPECIAL INSPECTION SERVICES				
MATERIAL / ACTIVITY	**SERVICE**	**EXTENT**	**AGENT***	**DATE COMPLETED**
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Periodic		
1705.13.4 Designated Seismic System Verification				
Inspect and verify that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with 13.2.2 of ASCE 7-16	Field inspection	Periodic		
1. Architectural Designated Seismic Systems (per ASCE 7-16)				
a.Egress Stairs	Field Inspection	Periodic		
2. Mechanical & Electrical Designated Seismic Systems (per ASCE 7-16)				
a. Mechanical and Electrical Components				
9) Emergency Light fixtures and Exit Signs	Field Inspection	Periodic		
c. Distribution Systems				
3) Electrical conduit and cable trays for Emergency Lighting	Field Inspection	Periodic		
7) Fire Protection Sprinkler Pipe System	Field Inspection	Periodic		
1705.13.6 Plumbing, Mechanical and Electrical Components Special Inspections for Seismic Resistance				
6. Inspection during the installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed to verify on of the following:				
a. Minimum clearances have been provided as required by Section 13.2.3 ASCE 7	Field inspection	Periodic		
b. A nominal clearance of not less than 3 inches has been provided between fire protection sprinkler system drops and sprigs and; structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems piping	Field inspection	Periodic		
1705.18 Fire-Resistant Penetrations and Joints				
1. Inspect penetration firestop	Field testing	Per ASTM E 2174		
2. Inspect fire-resistant joint systems	Field testing	Per ASTM E 2393		
Other				

SCHEDULE OF SPECIAL INSPECTION SERVICES				
MATERIAL / ACTIVITY	**SERVICE**	**EXTENT**	**AGENT***	**DATE COMPLETED**
2. Site Grading - develop stripping techniques suitable to site condition - review and advise on size of earth moving equipment - verify that soils will not loose strength during earth movemimg operations - observe grading	Field Inspection	Periodic		
3. Site Excavation				
a. Determine equipment sizes, and develop excavation, proof-rolling, undercutting, filling, and compaction techniques best suitable to site conditions at the time of construction	Field Inspection	Periodic		
b. Observe the site excavation - perform applicable laboratory and field tests - provide professional judgment in determining the limits of undercutting. This judgment shall be to the satisfaction of Architect Engineer - See Section 1705.6 for foundation requirements	Field Inspection	Continuous		
4. Site Trenching				
a. develop excavation, proof-rolling, undercutting, filling, and compaction techniques best suitable to site conditions at the time of construction -	Field Inspection	Periodic		
b. analyze soil materials to be used as fill	Field Inspection	Periodic		
c. perform applicable laboratory and field tests	Field Inspection	Periodic		
d. provide professional judgment in determining the limits of undercutting. This judgment shall be to the satisfaction of Architect Engineer.	Field Inspection	Continuous		
5. Site Fill - test soil for Plasticity Index, Sieve Analysis, Water Content, Density, etc. Analyze soil for quality of soil to be used as fill.	Field Inspection	Periodic		
6. Asphalt Paving - evaluate aggregate base course compaction, perform tests on asphalt in accordance with AI MS-2.	Field Inspection	Periodic		
7. Concrete Paving - evaluate aggregate base course compaction, perform compressive strength tests, perform slump tests per set of cylinders	Field Inspection	Periodic		

*** INSPECTION AGENTS**	**FIRM**	**ADDRESS**	**TELEPHONE NO.**
1.			
2.			
3.			
4.			
5.			

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of th Special Inspector(s) and/or testing agencies are subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

SCHEDULE OF SPECIAL INSPECTION SERVICES				
MATERIAL / ACTIVITY	**SERVICE**	**EXTENT**	**AGENT***	**DATE COMPLETED**

3. Special Inspections as required by Section 1704.2.5 are not required where the fabricator is approved in accordance with IBC Section 1704.2.5

4. Observe on a random basis, operations need not be delayed pending these inspections. Perform these tasks for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360,

Circle "Yes" or "No" as appropriate and date this document below:

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

FINAL REPORT OF SPECIAL INSPECTIONS

(Completed by each Special Inspector)

PROJECT: _____

LOCATION: _____

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

_____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: _____

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents and approved design revisions.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered ___ to ___ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

_____

_____

_____

_____

_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____

Special Inspection Agent/Firm

_____

Type or print name of Special Inspector

_____

Signature Date

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind- or seismic force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the Statement of Special Inspections (Requirements for Seismic or Tornado Resistance) must submit a Statement of Responsibility, in accordance with the Building Code, Section 1704.4.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

_____
_____
_____
_____
_____
_____
_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to achieve conformance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement

Nonstructural Components Certificate of Compliance

For structures assigned to Seismic Category B, C, D, E, or F where the requirements of Section 13.2.1 of ASCE 7 for nonstructural components, supports or attachments are met by seismic qualification as specified by Item 2 described therein and as specified by the registered design professional.

Project: _____

Address: _____

Seismic Design Category: _____

Nonstructural Component: _____

Qualification Method: (Check all that apply)

a. Analysis: _____

b. Testing: _____

c. Experience Data: _____

Description of nonstructural component:

_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that the items described above meet the requirements specified by the registered design professional on the approved construction documents for seismic qualification as per Section 1704.5 of the Building Code
.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of qualification method, building code evaluation service report or any other pertinent information.

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1704.2.5 Inspection of Fabricators				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A, N			
Cold formed metal construction	A, N			
1705.2 Steel Construction				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
1705.2.2, 1705.2.3 and 1705.2.4 Steel Construction other than Structural Steel				
Welding	C, F, G	C, F, G	A	A
Cold-formed Steel Deck		C, F, G	A	A
Open-Web Steel Joist and Joist Girders		C, F, G	A	A
Cold-formed Steel Trusses spanning ≥ 60ft		A, C	A	A
1705.3 Concrete Construction				
Reinforcing placement, cast-in-place bolts, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H, Q		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D, H		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
Inspection of post-installed anchors in hardened concrete		A, C, S		
1705.4 Masonry				
Review f'_m prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, f'_m		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
1705.5 Wood Construction				
Observe structural panel sheathing, size of framing members, fastener diameter and length, number of fastener lines, and spacing of fastener lines and fasteners for compliance with approved construction documents for the project		A, N		
Metal-plate-connected wood trusses: verify temporary and permanent truss bracing is installed per approved truss submittal package		A, N		

(Table continued on next page)

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1705.6 Soils				
Observe site preparation, fill placement and testing of compaction for compliance with the construction documents for the project		A, C, I, R		
Observe and test bearing materials below shallow foundations for ability to achieve design bearing capacity		A, L		
Review compaction testing for compliance with the construction documents for the project				A
1705.7, 1705.8 & 1705.9, 1705.10 Driven Deep, Cast-in-place Deep, and Helical Pile Foundations				
Observe installation		A, L, I		
Observe load tests		A, I		
1705.12 Special Inspection for Wind Resistance				
Structural wood		A, N		
Cold-Formed steel light-frame construction		A, N		
Inspect roof cladding		A, B, N		
Inspect wall cladding		A, B, N		
1705.13 Special Inspection for Seismic Resistance				
1705.13.1 Structural Steel				
Inspection of structural steel in the seismic force-resisting systems		A, C		
1705.13.2 Structural Wood				
Inspection of structural wood in the seismic force-resisting systems		A, N		
1705.13.3 Cold-Formed Steel Light-Frame Construction				
Inspection of cold-formed steel light-frame construction in the seismic force-resisting systems		A, N		
1705.13.4 Designated Seismic Systems				
Examine designated seismic systems requiring seismic qualification and verify that the label, anchorage or mounting conform to the certificate of compliance		A	A	A
1705.13.5 Architectural Components				
Inspection of exterior cladding, non-load bearing walls, veneer, and access floors		A, B	A, B	A, B
1705.13.6 Plumbing, Mechanical and Electrical Components				
Inspection of installation and anchorage of mechanical and electrical components		A	A	A
1705.13.7 Storage Racks				
Inspection of anchorage of storage racks 8 feet or taller		A		
1705.13.8 Seismic Isolation Systems				
Inspection of seismic isolation systems in seismically isolated structures	A	A		
1705.13.9 Cold-Formed Steel Special Bolted Moment Frames				
Inspection of cold-formed steel special bolted moment frames		A, N		
1705.14 Testing for Seismic Resistance				
Testing designated seismic systems requiring seismic qualification and verify that the label, anchorage or mounting conform to the certificate of compliance		A		
1705.15 Sprayed Fire-Resistant Materials				
Observe surface conditions, application, average thickness and density of applied material, and cohesive/adhesive bond		A, C		

(Table continued on next page)

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*				
Category of Testing and Inspection	**Minimum Qualifications (refer to key at end of Table)**			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1705.16 Mastic and intumescent fire-resistant coatings				
Observe application compliance with AWCI 12-B		A, C		
1705.17 Exterior Insulation and Finish Systems				
Inspect EIFS systems		A, B, C, M		
1705.18 Fire-resistant penetrations and joints				
Inspection of Penetration firestops		A, C, P		
Inspection of Fire-resistant joint systems		A, C, P		
1705.19 Testing for Smoke Control	*See Requirements of Building Code Section 1705.19.2.*			
1705.20 Sealing of Mass Timber		A, C, P		
(Table continued on next page)				

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

KEY:

A. Arkansas Professional Engineer (AR PE) competent in the specific task area or graduate of accredited engineering/engineering technology program under the direct supervision of an AR PE.
B. Arkansas Registered Architect (AR RA) competent in the specific task area or graduate of accredited architecture/architecture technology program under the direction of an AR RA.
C. International Code Council (ICC) Special Inspector Certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
D. Post-tensioning Institute (PTI) Certification, Level 2.
E. Pre-stressed Concrete Institute (PCI) Plant Quality Personnel Certification – Level III.
F. American Welding Society (AWS) Certified Welding Inspector (CWI) or AWS Certified Associate Welding Inspector working under the direct on-site supervision of a CWI.
G. American Society for Nondestructive Testing (ASNT) Level II certification, or a Level III certification if previously certified as a Level II in the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
H. American Concrete Institute (ACI) Concrete Construction Special Inspector.
I. National Institute for Certification in Engineering Technologies (NICET) Level II or higher certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
J. ACI Concrete Field Testing Technician with Grade 1 certification or Center for Training Transportation Professionals (CTTP) Certified Concrete Field Testing Technician.
K. American Concrete Institute (ACI) Masonry Field Testing Technician
L. NICET Certified Engineering Technologist (CT) competent in the specific task area.
M. Association of the Wall and Ceiling Industry (AWCI) EIFS Inspector Certification.
N. International Code Council (ICC) Commercial Building Inspector Certification.
O. International Code Council (ICC) Mechanical Inspector Certification.
P. Inspector has passed either the Underwriters Laboratory (UL) Firestop Contractor Program Examination or the Factory Mutual (FM) Firestop Examination.
Q. Pre-stressed Concrete Institute (PCI) Certified Field Auditor
R. Center for Training Transportation Professionals (CTTP) Certified Soil Testing Technician.
S. American Concrete Institute (ACI) Post-Installed Concrete Anchor Installation Inspector

Notes:

1. *The Special Inspector shall meet one of the minimum qualifications listed for the applicable Category of Testing and Inspection.*
2. *Materials testing shall be done by an Approved Testing Agency meeting the requirements of the Building Code Section 1703 and ASTM E 32*9.

SPECIAL INSPECTION REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:
DATE OF INSPECTION:
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:
LIST TESTS MADE:
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:
COMMENTS:
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	

SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

DISCREPANCY NOTICE No. _____

SPECIAL INSPECTION DISCREPANCY NOTICE

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
APPLICABLE DRAWING SHEET NUMBER(S) AND/OR SPECIFICATION SECTION:		
NOTICE DELIVERED TO: O CONTRACTOR O ENGINEER/ARCHITECT O OWNER	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	
DATE RE-INSPECTED AND APPROVED AND SIGNATURE OF SPECIAL INSPECTOR:		

One copy of this report to remain at job site with the contractor for review upon request.

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

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

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.02 TEMPORARY UTILITIES

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

B. Provide and pay for distribution of all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

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

1.03 TELECOMMUNICATIONS SERVICES

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

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Telephone Land Lines: One line, minimum; one handset per line.
   3. Internet Connections: Minimum of one; DSL modem or faster.
   4. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.
   5. Facsimile Service: Fax-to-email software on personal computer.

1.04 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities located at the 2nd floor is permitted.

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

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

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings adjacent to the site, if required.

C. Provide protection for plants designated to remain. Replace damaged plants.

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

E. Traffic Controls: As required by the City of Little Rock for construction access.

1.06 FENCING

A. Construction: Commercial grade chain link fence.

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

1.07 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.09 SECURITY

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

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

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

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

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

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, additional off-site parking may be required.Co-ordinate with UALR.

1.11 WASTE REMOVAL

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

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

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

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

1.12 FIELD OFFICES

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

B. Construction meeting location to be confirmed with Architect prior to starting work.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5930
SECURITY REGULATIONS

PART 1 GENERAL

1.01 GENERAL SECURITY REQUIREMENTS

A. Bidding Clearances: Bidders will be required to comply with security regulations imposed by the occupying agency including any necessary clearances. Access to the project site will be limited to specific times established by the Government.

B. Construction Clearances: After award of the Contract, all Contractor employees shall be required to furnish information for security clearances and shall comply with security regulations as imposed by the occupying agency.

C. Notification: Notify the Architect, or his designated representative, not less than 48 hours prior to performing work in a security area. Include the following:
   1. Companies: Name of each company performing the work.
   2. Personnel: Name, social security number and date of birth of each individual who is to work.
   3. Time: The exact time, date, and hours of work.
   4. Areas: Specific areas of the building in which work is to be performed.

1.02 GENERAL SECURITY REGULATIONS

A. Nonpublicity: It is a specific condition of this Contract that the Contractor, or any subcontractors performing work on this project, shall not use or allow to be used any aspect of this project for publicity or advertising brochures.

B. Agency Security Regulations: All persons employed within the boundaries of the property or restricted-access areas therein, and all persons permitted to enter such property and areas shall comply with the security regulations that have been established for this Contract.
   1. The Contractor agrees on behalf of himself and all subcontractors that the following security regulations will be observed by Contractor and subcontractor personnel on the property. The Contractor shall make it a specific provision of his subcontracts that these regulations be accepted.
   2. At the commencement of the work under this Contract, the following security facilities and procedures will apply:
      a. The Contractor shall provide information about all Contractor and subcontractor personnel and others who require continuing access to the site, before access is required and when access ceases.
      b. Within 10 calendar days after the award of the Contract, the Contractor shall submit a list on the Contractor's letterhead stationary of all employees, subcontractors and their employees, and others who will perform work or otherwise require access to the site. Personnel shall be listed in alphabetical order by company. The list shall include the full name, social security number and date of birth for each individual.
      c. Name of any employee added later to the original list shall be submitted with the same information on the Contractor's letterhead stationary at least 8 calendar days in advance of the date of access by the employee.
      d. The Contractor shall notify the Government in writing when personnel are no longer employed by the Contractor or a subcontractor. Individual's name, social security number and date of birth, and company who employed the individual, shall be included.
   3. At the commencement of the work under this contract, the following security procedures shall apply to the Contractor and all subcontractors.
      a. Do not enter the building without building passes or park without parking permits. Vehicle authorization requests shall be required for any vehicle entering the site, and shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies, and, with a permit issued by the Government, to parking in designated areas.

b. Comply with the security regulations of the existing building.
c. In the case of any questions as to the eligibility of an individual to obtain a pass, notify the Architect, who will obtain a determination whether the individual can obtain a pass.
d. Cameras are not permitted without written permission from the Occupant Agency and the Architect or his designated representative. If approved, permission will be granted in writing and will provide additional guidelines. In any case, all film will be turned over to the Architect or his designated representative. The Contractor shall be responsible for the costs of developing film.
e. Personnel may be subject to inspection of their personal effects when entering and leaving the facility. In addition, unscheduled inspections of personnel may be made while on site.
f. If any work is canceled, notify the Architect or his designated representative.

4. The Occupant Agency reserves the right to close down the job site and order Contractor personnel off the premises in the event of a national emergency or a shut-down, for as long as security problems persist. The Contractor may only return to the site with verbal approval from the Occupant Agency and the Architect or his authorized representative.
5. The Government reserves the right to exclude or remove from the site or building any employee of the Contractor or a subcontractor whom the Government deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the work is deemed by the Government to be contrary to the public interests. The Government further reserves the right to complete processing of the security documentation for personnel assigned to work within restricted access areas prior to access to such areas by the personnel.
6. No interviews shall be conducted within the secured area. The Contractor and subcontractors will be required to maintain a field office, outside the limits established by the security area, for all public contacts. Applicants for employment and other persons not entitled to access to the secured area shall be required to contact the Contractor or subcontractor at these offices.
7. For overtime work, the Contractor shall give the Architect or his designated representative at least 3 calendar days notice. This notice is required so that security escorts may be provided and is separate and distinct from any notices required for utility shutdown or other outages. Also, the Contractor shall notify the Government if personnel will not report to the job site on a particular day so that the security escort can be released for other duties.
8. A detailed weekly schedule shall be submitted once a week by the close of business on the last day of the previous week's work. The schedule shall include the following:
   a. Specific location of work for each trade.
   b. Description of work for each trade.
   c. Number of persons who will be on site for each location and trade.
   d. Specific impacts required, such as equipment or utility shutdowns.
   e. Hours of operation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 5950
SAFETY AND HEALTH

PART 1 GENERAL

1.01 SUMMARY

A. References: In addition to publications referenced in the Construction Contract Clauses, the following Code of Federal Regulations (CFR) publications designate and define hazardous materials and conditions, and establish procedures for handling these materials and conditions.
   1. 29 CFR, Part 1910: Occupational Safety and Health Administration (OSHA) General Industry and Health Standards.
   2. 29 CFR, Part 1926: OSHA Construction Industry Standards.
   3. 40 CFR, Part 61: National Emission Standards for Hazardous Air Pollutants.
   4. 40 CFR, Part 261: Environmental Protection Agency (EPA) Characteristics of Hazardous Waste.
   5. 40 CFR, Part 761, EPA Polychlorinated Biphenyls (PCBs), Manufacturing, Processing, Distribution in Commerce and Use Prohibitions.
   6. 40 CFR, Part 763: EPA Asbestos.

B. Hazardous Materials: Some hazardous and toxic materials and substances are included in 29 CFR Part 1910, subparts H and Z, and in 29 CFR Part 1926. Commonly encountered hazardous materials include but are not limited to asbestos, PCBs, explosives and radioactive material.
   1. Asbestos may be found in spray-on fireproofing, insulation, boiler lagging, pipe coverings floor tile, and other materials.
   2. PCBs may be contained in transformers, capacitors, voltage regulators, oil switches, mechanical insulation and other materials.

C. Acquisition of Publications: Referenced CFR publications may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

1.02 SAFETY MEETING

A. Prior to commencing construction, representatives of the Contractor, including the principal on-site project representative and one or more safety representatives, shall meet with designated representatives of the Architect for the purpose of reviewing the Contract's safety and health requirements.

B. The Contractor's safety and health program shall be reviewed, and implementation of safety and health provisions pertinent to the Work shall be discussed.

1.03 COMPLIANCE WITH REGULATIONS

A. The Work, including contact with or handling of hazardous materials, disturbance or dismantling of structures containing hazardous materials, and disposal of hazardous materials, shall comply with the applicable requirements of 29 CFR Parts 1910 and 1926, and 40 CFR Parts 61, 261, 761 and 763.
   1. Work involving disturbance or dismantling of asbestos or asbestos containing materials, demolition of structures containing asbestos and removal of asbestos, shall comply with 40 CFR Part 61, Subparts A and M, and 40 CFR Part 763, as applicable
   2. Work shall additionally comply with applicable state and local safety and health regulations.
   3. In case of a conflict between applicable regulations, the more stringent requirements shall apply.

B. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable codes, standards and regulations pertaining to the health and safety of personnel during execution of the Work, and shall hold the Government harmless for any action on the Contractor's part, or that of the Contractor's employees or subcontractors, that results in illness, injury or death.

1. The Contractor shall have written safety and health programs in compliance with 29 CFR Parts 1910 and 1926.

1.04 SUBMITTALS

A. Safety and Health Programs: The Contractor shall submit, for approval, copies of the project safety and health programs, as applicable to the work scope, or required as a result of the safety meeting, including but not necessarily limited to the following:
   1. Occupational Noise Exposure.
   2. Fall Protection.
   3. Personnel Protective Equipment.
   4. Control of Hazardous Energy.
   5. Electrical Safety Related Work Practices.
   6. Lead.
   7. Asbestos.
   8. Respirator Protection.
   9. Confined spaces.

B. Contractor's Safety Plan: In addition to specific safety and health programs applicable to the project, Contractor shall submit firm's general safety plan listing emergency procedures and contact persons with home addresses and telephone numbers.

C. Permits: If hazardous materials are disposed of off-site, submit copies of shipping manifests and permits from applicable federal, state or local authorities and disposal facilities, and submit certificates that the material has been disposed of in accordance with regulations.

D. Accident Reporting: Submit a copy of each accident report that the Contractor or Subcontractors submits to their insurance carriers, within seven calendar days after the date of the accident.

PART 2 PRODUCTS

2.01 PERSONNEL PROTECTIVE EQUIPMENT

A. Special facilities, devices, equipment and similar items used by the Contractor in execution of the Work shall comply with 29 CFR Part 1910, Subpart I and other applicable regulations.

2.02 HAZARDOUS MATERIALS

A. The Contractor shall bring to the attention of the Architect, or the Architect's authorized representative, any material encountered during execution of the Work that the Contractor suspects is hazardous and not already identified to be abated.

B. The Architect shall determine whether the Contractor shall perform tests to determine if the material is hazardous.

C. If the Architect directs the Contractor to perform tests and the material is found to be hazardous, or if the material is found to be hazardous without Contractor testing, a change to the Contract price may be provided, subject to the applicable provisions of the Contract.

PART 3 EXECUTION

3.01 EMERGENCY SUSPENSION OF WORK

A. When the Contractor is notified by the Architect, or the Architect's authorized representative, of non-compliance with the safety or health provisions of the Contract, the Contractor shall immediately, unless otherwise instructed, correct the unsafe or unhealthy condition.
   1. If the Contractor fails to comply promptly, all or part of the Work will be stopped by notice from the Architect or the Architect's authorized representative.
   2. When, in the opinion of and by notice given by the Architect or the Architect's authorized representative, satisfactory corrective action has been taken by the Contractor, work shall resume.
   3. The Contractor shall not be allowed any extension of time or compensation for damages in connection with a work stoppage for an unsafe or unhealthy condition.

3.02 PROTECTION OF PERSONNEL

A. The Contract shall take all necessary precautions to prevent injury to the public, occupants, or damage to property of others. The public and occupants includes all persons not employed by the Contractor or a subcontractor.

B. Wherever practical, the work area shall be fenced, barricaded or otherwise blocked off from the public or occupants to prevent unauthorized entry into the work area.
   1. Provide traffic barricades and traffic control signage where construction activities occur in vehicular areas.
   2. Corridors, aisles, stairways, doors and exitways shall not be obstructed or used in a manner to encroach upon routes of ingress or egress utilized by the public or occupants, or to present an unsafe or unhealthy condition to the public or occupants.
   3. Store, position and use equipment, tools, materials, scraps and trash in a manner that does not present a hazard to the public or occupants by accidental shiftings, ignition or other hazardous activity.
   4. Store and transport refuse and debris in a manner to prevent unsafe and unhealthy conditions for the public and occupants. Cover refuse containers, and remove refuse on a frequent regular basis acceptable to the Architect. Use tarpaulins or other means to prevent loose transported materials from dropping from trucks.

3.03 ENVIRONMENTAL PROTECTION

A. Dispose of solid, liquid and gaseous contaminants in accordance with local codes, laws, ordinances and regulations.

B. Comply with applicable federal, state and local noise control laws, ordinances and regulations, including but not limited to 29 CFR 1910.95 and 29 CFR 1926.52.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

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

1.03 SUBMITTALS

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

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

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

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

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

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

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

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

2.02 NEW PRODUCTS

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

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

C. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.

3. Are made of recycled materials.
4. Are Cradle-to-Cradle Certified.
5. Have a published GreenScreen Chemical Hazard Analysis.

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

2.03 PRODUCT OPTIONS

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

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

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

2.04 MAINTENANCE MATERIALS

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

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

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

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

3.03 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.04 STORAGE AND PROTECTION

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

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

C. Store with seals and labels intact and legible.

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

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

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

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

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

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

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

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

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

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

END OF SECTION

SECTION 01 7000
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Demonstration and instruction of Owner personnel.

F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

G. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.05 QUALIFICATIONS

A. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

C. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

D. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After tenant occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of tenant's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

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 PREINSTALLATION MEETINGS

A. When required in individual specification sections, 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 days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7310
CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
   2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.03 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.04 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.05 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.06 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.03 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete & Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 01 7350
FIRE PREVENTION PRECAUTIONS FOR HOT WORK

PART 1 GENERAL

1.01 SUMMARY

A. This section applies to safeguards to be observed in performing hot work, including welding, soldering, brazing and other operations where open flames or implements utilizing heat are used.

1.02 SAFETY PRECAUTIONS

A. The Contractor shall ensure that operations involving the use of open-flame, electrical arc equipment or flammable substances are not conducted until a permit for welding, cutting, and burning has been completed, signed and issued by the GSA Property Manager.

B. Prior to commencing operations, a positive determination shall be made that it is impractical to conduct the hot work in a shop area or outside of the building. Coordinate suitable locations for hot equipment operations agreeable to the Architect's Representative.

1.03 NOTIFICATON

A. The Contractor shall notify the Architect's Representative of the area of operations for each day and of all subsequent changes that occur.

B. The Contractor shall notify the GSA Property Manager of all locations where hot work has been performed not less than 30 minutes or more than 90 minutes after work is completed or stopped for the day.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 INSPECTION

A. Before starting operations, the Contractor shall furnish trained personnel to provide fire watches for locations where hot work is to be performed. One fire watcher may observe several locations in a relatively small contiguous area if approved by the Architect's Representative.
   1. Contractor shall furnish suitable type, fully-charged, operable portable fire extinguisher to each fire watcher.
   2. The Contractor shall provide fire watchers who know how to operate the fire extinguisher, how to turn on a fire alarm and how to summon the fire department.

B. Before starting operations, take suitable precautions to minimize the hazard of a fire communicating to the opposite side of walls, floors, ceilings and roofs from the operations.

3.02 SAFETY MEASURES

A. Hot work shall not be done in or near rooms or areas where flammable liquids or explosive vapors are present or thought to be present. A combustible gas indicator (explosimeter) test shall be conducted to assure that each area is safe. The Contractor is responsible for arranging and paying for each test.

B. Insofar as possible, the Contractor shall remove and keep the area free from all combustibles, including rubbish, paper and waste within a radius of 25 feet from hot operations.
   1. If combustible material cannot be removed, the Contractor shall furnish fireproof blankets to cover such materials. At the direction of the Building Manager or Architect's Representative, floors, walls, and ceilings of combustible material shall be wetted thoroughly with water before, during, and after operations sufficiently to afford adequate protection.
   2. Where possible, the Contractor shall furnish and use baffles of metal or gypsum board to prevent the spraying of sparks, hot slag and other hot particles into surrounding combustible material.

C. The Contractor shall prevent the spread of sparks and particles of hot metal through open windows, doors, and holes and cracks in floors, walls, ceilings and roofs.

D. Cylinders of gas used in hot work shall be placed a safe distance from the work. The Contractor shall provide hoses and equipment free of deterioration, malfunction and leaks. Suitable supports shall be provided to prevent accidental overturning of cylinders. All cylinder control valves shall be shut off while in use with the gas pressure regulator set at 15 psi or less.

E. When hot work operations are completed or ended for the day, each location of the day's work shall be inspected by the Contractor 30 to 60 minutes after completion of operations to detect for hidden or smoldering fires and to ensure that proper housekeeping is maintained. Contractor shall cleanup the area of work at the end of each shift or workday.

F. Where sprinkler protection exists, the sprinkler system shall be maintained without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, gypsum board sheets or damp cloth guards may be used to shield the individual heads temporarily. The heads shall be inspected by the Contractor immediately after hot work operations cease, to ensure all materials have been removed from the heads and that the heads have not been damaged.

G. Suitable type, fully-charged, operable portable fire extinguisher shall be available at all times during hot work operations.

H. If any of the above safeguards are not employed, or are violated, the Architect's Representative may, by written notice, stop the work until compliance is obtained. Such stoppage shall not relieve the Contractor form performing his work within the Contract period for the Contract price.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 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 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   3. Field changes of dimension and detail.
   4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. 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.

C. 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.

D. Provide servicing and lubrication schedule, and list of lubricants required.

E. Include manufacturer's printed operation and maintenance instructions.

F. Include sequence of operation by controls manufacturer.

G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

D. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

E. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, 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 instructions for equipment and systems.
    f. Maintenance instructions for special 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.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 02 7320
SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.

B. Related Sections include the following:
   1. Division 1 Section "Summary" for use of premises and Owner-occupancy requirements.
   2. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
   3. Division 1 Section "Cutting and Patching" for cutting and patching procedures.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   5. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid

delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.06 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
   1. Comply with requirements specified in Division 1 Section "Summary."

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify the Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: None Known.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.07 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
   1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Building manager will arrange to shut off indicated services/systems when requested by Contractor.

2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
4. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
2. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
3. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.06 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 02 8319
LEAD-BASED PAINT REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

A. Description of lead-based paint remediation and exposure assessment procedures

1.02 REFERENCES

A. OSHA 29 CFR 1926.62 - Lead Exposure in Construction

B. OSHA 29 CFR 1910.1025 - Lead Exposure in General Industry

C. OSHA 29 CFR 1910.134 - Respirator Standard

D. OSHA 29 CFR 1926.59 - Hazard Communication Standard

E. EPA 40 CFR Part 261 – Resource Conservation and Recovery Act

F. ADEQ - Arkansas Lead-Based Paint-Hazard Regulation 25

PART 2 PRODUCTS

2.01 MATERIALS

A. Soap: Mild soap, such as "Ivory Liquid".

B. Abrasive Cleaners: Very mildly abrasive cleaner with whiting and pumice, such as "Bon Ami", baking soda mixed with mild soap, Barkeeper's Friend, etc.

C. Car wax, such as those formulated for chromium-plated items or approved equal.

D. Clean, soft cloths, chamois leather, or nylon pad (such as Scotch-Brite).

2.02 EQUIPMENT

A. Natural bristle brush

B. Sponge

2.03 LIMITATIONS

A. CLEANING AGENTS NOT TO BE USED: chloride cleaning agents, hypochloride bleaches, silver cleaners.

PART 3 EXECUTION

3.01 SUMMARY OF WORK

A. The project includes demolition of surfaces containing lead-based paint. A contractor specializing in lead abatement will perform selective demolition of a representative number of surfaces containing lead-based paint for the purpose of assessing the lead exposure potential. The lead abatement contractor shall coordinate with the demolition contractor and GSA's environmental consultant to ensure all types of demolition, equipment and methods are represented in the exposure assessment.

B. OSHA 29 CFR 1926.62 shall be followed when an employee may be occupationally exposed to lead.

C. If lead-based painted surfaces are to be broken, sanded, or scraped, OSHA requires certain protective provisions. These provisions include employee exposure assessment, respiratory protection program, protective clothing, housekeeping, hygiene facilities and practices, biological monitoring, and proper employee lead hazards training.

3.02 WORKER'S PROTECTION

A. OSHA's "Lead Exposure in Construction; Interim Final Rule" found in 29 CFR 1926.62 lists tasks that automatically require worker protection measures, regardless of lead concentration, prior to establishing the level of potential lead exposure. These tasks are divided into three classifications based upon the potential risk of exposure where lead containing coatings or paint are present. Level (1) tasks consist of manual demolition of structures, manual scraping,

manual sanding, heat gun applications, power tool cleaning with dust collection systems and spray painting with lead paint. A half face, air purifying respirator with high efficiency filters must be worn when performing these tasks. Level (2) tasks are considered to be those where lead containing coatings or paint are present during rivet busting, power tool cleaning without dust collection systems, cleanup activities where dry expandable abrasives are used, abrasive blasting enclosure movement and removal. Powered air purifying respirators (PAPR) or equivalent must be worn when performing these tasks. Level (3) tasks are those where lead containing coatings or paint are present on structures when performing abrasive blasting, welding, cutting, and torch burning. A full face supplied air respirator or equivalent must be worn when performing these tasks. OSHA 1926.62 requires certain protective provisions that apply to all three tasks.

3.03 EMPLOYEE EXPOSURE ASSESSMENT

A. The Contractor shall perform an employee exposure assessment according to OSHA 1926.62 (d), to determine if any employee is exposed to lead at or above the action level of 30 micrograms per cubic meter of air calculated as an 8-hour TWA. An employee exposure assessment requires collection of personal samples by a qualified competent person, representative of a full shift, including at least one sample for each job classification. Full shift personal samples must represent the employee's regular daily exposure to lead.

B. Copies of the exposure assessment shall be made available to the GSA's environmental consultant.

C. Note that previous construction projects in this building, involving demolition of similar LBP containing surfaces as on this project, have resulted in Exposure Assessment levels well below the 30 mg/M3 action limit. Although this does not guarantee such results on this project.

3.04 ENGINEERING AND WORK PRACTICES

A. The Contractor shall implement engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead at or below the permissible exposure limit. Engineering controls include mechanical ventilation, local exhaust ventilation, shrouded tools, vacuums and wetting agents.

B. Post warning signs in each work area where lead exposure occurs. The following wording should be on the sign:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

3.05 HYGIENE FACILITIES AND PRACTICES

A. The Contractor shall provide adequate washing facilities according to OSHA 1926.62 (i), at the worksite so workers can remove lead particles that accumulate on the skin or hair. OSHA requires that change areas, showers, and eating facilities be provided when lead levels exceed the Permissible Exposure Limit.

3.06 MEDICAL SURVEILLANCE

A. The Contractor shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

B. The Contractor shall institute a medical surveillance program in accordance with OSHA 1926.62 (j) for all employees who are or may be exposed at or above the action level for more than 30 days in any consecutive 12 months.

3.07 CLEAN-UP AND DISPOSAL PROCEDURES

A. HEPA vacuuming shall be used to clean-up floors and other surfaces. Shoveling, dry and wet sweeping, and brushing may be used where HEPA vacuuming is not feasible.

B. Disposal of lead-containing waste is regulated under the Resource Conservation and Recovery Act (RCRA). EPA requires that representative lead abatement wastes be tested to determine if the materials are regulated. The analysis used to determine applicability is the Toxicity Characteristic Leaching Procedure (TCLP). Lead containing waste with TCLP results greater than or equal to 5.0 mg/L is considered hazardous waste and is regulated under RCRA. The GSA's environmental consultant shall collect and analyze TCLP samples.

C. Note that previous construction projects in this building, involving demolition of similar LBP containing surfaces as on this project, have resulted in TCLP levels well below the 5.0 mg/L limit. Although this does not guarantee such results on this project.

END OF SECTION

SECTION 03 0512

WATERPROOF CONCRETE CONSTRUCTION

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 specifies concrete with Hydrophobic Concrete Admixture and System as indicated on the project drawings for the following:
   1. Footings
   2. Foundation walls
   3. Slabs-on-grade
   4. Suspended slabs

B. Related Sections:
   1. Section 03 3000 - Cast-in-Place Concrete

1.03 REFERENCES

A. American Concrete Institute (ACI)
   1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2002).
   2. ACI 301 - Specifications for Structural Concrete for Buildings; 2010.
   3. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
   4. ACI 305R - Hot Weather Concreting; 2010.
   5. ACI 306R - Cold Weather Concreting; 2010.
   6. ACI 308 - Standard Specification for Curing Concrete; 2011.
   7. ACI 309R - Guide for Consolidation of Concrete; 2005.
   8. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
   9. ACI 357 - Guide for the Design and Construction of Fixed Offshore Concrete Structures; 2014.

B. ASTM International (ASTM)
   1. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2014.
   2. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2014.
   3. ASTM A820/A820M - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete; 2011.
   4. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2014.
   5. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2012.
   6. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
   7. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2014.
   8. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2014.
   9. ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete; 2013.
   10. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
   11. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
   12. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2010.
   13. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

14. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2014
15. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
16. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
17. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).
18. ASTM C595 - Standard Specification for Blended Hydraulic Cements; 2014
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
20. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2013.
21. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete; 2013
22. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete; 2012
23. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement; 2011
25. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.
26. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
27. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012
28. ASTM C1611 - Standard Test Method for Slump Flow of Self-Consolidating Concrete; 2011
29. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2013c.

C. British Standards Institution (BSI)
1. BS 1881-122 - Testing Concrete Methods for Determination of Water Absorption

1.04 SUBMITTALS

A. Submit listed submittals in accordance with the Conditions of the Contract and Division 01 (Submittal Procedures Requirements).

B. Product Data: Submit Hydrophobic Concrete Admixture Manufacturer’s printed data and instructions for proprietary products and equipment.

C. Shop Drawings: Submit concrete placement procedures and plan drawings showing locations of isolation joints, contraction (control) joints, and construction joints for slab-on-grade concrete. Concrete waterproofing-related drawings will be reviewed and approved by the Hydrophobic Concrete Admixture Manufacturer technical personnel before submittal.

D. Quality Assurance/Control Submittals will include:
1. Test Reports: Upon request, provide test reports from recognized test facilities of material properties and standards compliance.
2. Certificates: Submit Hydrophobic Concrete Admixture Manufacturer’s certification that the products meet or exceed the specified requirements.
3. Supplier Field Reports: Include reports of concrete suppliers, field quality-control observations, measurements, and tests.

E. Close-Out Submittals: Submit the following:
1. Specified warranty documents.

1.05 QUALITY ASSURANCE

A. Hydrophobic Concrete Admixture Manufacturer Qualifications: Hydrophobic Concrete Admixture Manufacturer will have a minimum of 5 years of experience on projects of similar scope.

B. Manufacturer quality assurance during design, preconstruction and construction:
   1. Hydrophobic Concrete Admixture Manufacturer will review and approve the waterproofing details and procedures, including the joint detailing, the waterstop detailing, the reinforcing steel detailing, and all related information.
   2. Hydrophobic Concrete Admixture Manufacturer will review and approve the service penetration details prior to installation.
   3. Hydrophobic Concrete Admixture Manufacturer will provide pre-placement and placement inspection of hydrophobic concrete production and installation and document specification compliance.
   4. Hydrophobic Concrete Admixture Manufacturer will provide pre-placement and placement inspection of waterstop installation and document specification compliance.

1.06 SLAB OR MEMBER THICKNESS

A. Thickness of slab and other member to provide waterproofing to be as specified and not less than 6 inches. Any slab or other member to provide waterproofing that has a thickness of less than 6 inches to be increased to 6 inches, with design approved by the Architect Engineer.

1.07 PRE-INSTALLATION CONFERENCE

A. Arrange in compliance with Division 01.

B. Attendance: Contractor, installer, Owner, Architect Engineer, structural engineer, civil engineer, Hydrophobic Concrete Admixture Manufacturer representative, batch plant representative, and those requested to attend.

C. Meeting Time: Minimum of 3 weeks prior to the beginning of the work of this Section and work of related Sections affecting the work of this Section.

D. Location: Project site.

E. Review and document procedures for conducting work of this Section, including:
   1. Review of mix design and mix test results.
   2. Mixing procedure.
   3. Conditions for acceptance of concrete at project site.
   4. Placement procedures.
   5. Finishing options and procedures.
   6. Curing and crack control procedures.
   7. Testing for acceptable moisture emissions, alkalinity pH levels, and relative humidity of concrete slab prior to installation of finish flooring.
   8. Affect of the above on the project schedule.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Conform to provisions of the Section 01 65 10.

B. Conform to the Hydrophobic Concrete Admixture Manufacturer instructions.

C. Mixing and Delivery: Conform to ASTM C94.

D. Sampling at Delivery: Conform to ASTM C172. Cure 4-inch by 8-inch cylinders to provisions of ASTM C31 and compression test compressive strength of cylinders to ASTM C39.

E. Batch Tickets: Conform to ASTM C94 Option A or C. Accompany each load, fully executed, and signed. Log in with inspector at time of entry. Conform to Source Quality Control requirements specified by this Section.
   1. Include water content and water withheld at batch plant.
   2. Indicate time to nearest minute that batch was dispatched from plant, when it arrived at site, and when unloading began and was finished.
   3. Indicate ambient air temperature and concrete internal temperature at time of arrival.
   4. Make written record of water and other additives added to design mix, and the amount of concrete in the truck at the time of addition, after the mix truck left the batch plant.

F. Reject concrete that has reached internal temperature of 89 degrees Fahrenheit or above and when temperature has risen 5 degrees in 10 minutes, indicating concrete is setting up prior to discharge.

G. Store products in accordance with ACI 301. Do not use admixtures that have been in storage at project site for more than 12 months or which have been subjected to freezing, except as accepted by the Hydrophobic Concrete Admixture Manufacturer and by the structural engineer based on test results.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, Hydrophobic Concrete Admixture Manufacturer's standard warranty document executed by an authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the contract documents.

PART 2 PRODUCTS

2.01 HYDROPHOBIC CONCRETE ADMIXTURE

A. Product generic name: Water-Based Hydrophobic Concrete Admixture for Waterproof Construction plus Service and Performance Warranty.

B. Warranty
   1. 10 year waterproof warranty, which covers cost of repair of any leak in protected areas through industry-accepted and approved means.

2.02 ACCESSORIES

A. Waterstops and Groutable Hose Waterstop System:
   1. Waterstops:
      a. Shall be placed at all cold joints and penetrations
      b. b. Manufacturer and Product: Acceptable to Hydrophobic Concrete Admixture Manufacturer.
   2. Groutable hose waterstop systems:
      a. Shall be placed at vertical cold joints where required by Hydrophobic Concrete Admixture Manufacturer
      b. b. Manufacturer and Product: Acceptable to Hydrophobic Concrete Admixture Manufacturer.

B. Concrete Admixtures:
   1. Characteristics of all admixtures:
      a. Compatible with each other and free of intentionally-added chlorides.
      b. b. Manufacturer: Acceptable to Hydrophobic Concrete Admixture Manufacturer.
   2. Superplasticizer:
      a. Material: A Superplasticizer to reduce the water requirement of the concrete and to improve the workability for ease in placing and consolidating the concrete.
      b. b. Material Standard: ASTM C494, Type E, Type F, or Type G.
   3. Evaporation Retarder.
   4. Curing Compound:
      a. Shall conform to ASTM C309 or ASTM C1315
   5. Polypropylene Fiber Reinforcement.
   6. Air-Entraining Admixture:
      a. Shall conform to ASTM C260.
   7. Mid-Range Water-Reducing Admixture:
      a. Shall conform to ASTM C494 Type A.
   8. High-Range Water-Reducing Admixture:
      a. Shall conform to ASTM C494 Type F or ASTM C1017 Type I.
   9. Accelerating Admixture:
      a. Shall conform to ASTM C494 Type C or E.

10. Retarding Admixture:
    a. Shall conform to ASTM C494 Type B or D.
11. Shrinkage-Reducing Admixture.
12. Alkali-Silica Reaction Inhibiting Admixture:
    a. Shall contain a minimum of 30 percent lithium nitrate.

2.03 MIXES

A. The concrete ready mix supplier must contact the Hydrophobic Concrete Admixture Manufacturer before designing and testing any new mix designs, to receive guidance on achieving proper water absorption characteristics. The concrete ready mix supplier must also report the test results to the Hydrophobic Concrete Admixture Manufacturer. All values must be within the specification limits.
   1. All concrete materials used for testing must be same as concrete materials used for construction.
   2. Test result requirements for Hydrophobic Concrete in addition to indicated performance requirements: Corrected 30 minute water absorption, age at test 7 days (BS 1881-122): Not greater than 1.0%

B. Waterproofing System: All concrete as indicated shall be waterproofed by the addition of Hydrophobic Concrete Admixture and additional ingredients including:
   1. Hydrophobic Concrete Admixture at the rate of one U.S. gallon per cubic yard of concrete (5 liters per cubic meter).
   2. Superplasticizer at the manufacturer's recommended rate and appropriate for the placement requirements of the project.

C. Cementitious Content: The cementitious content of concrete containing Hydrophobic Concrete Admixture will not be less than 550 pcf (325 kg/m3) with up to 15 percent fly ash or 50 slag replacement.

D. Water-Cement Ratio: 0.42 maximum. Water content of Hydrophobic Concrete Admixture and other admixtures to be included in the water-to-cementitious ratio.

E. Compressive Strength, 28-day (ASTM C39): Specify strength.

F. Air Content (ASTM C173): Specify required test method, air content, and tolerance.

G. Slump (ASTM C143) Specify required slump.

H. Slump-Flow (ASTM C1611) Specify required slump flow.

2.04 SOURCE QUALITY CONTROL

A. Verification of Performance: Provide ready-mixed concrete from a concrete supplier approved by the Hydrophobic Concrete Admixture Manufacturer and authorized to dispense the Hydrophobic Concrete Admixture Manufacturer's waterproofing materials.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with the Hydrophobic Concrete Admixture Manufacturer's instructions and recommendations.

3.02 EXAMINATION

A. Site verification of conditions:
   1. Verify that site conditions are acceptable for placement of waterproofed concrete.
   2. Utilize Hydrophobic Concrete Admixture Manufacturer's pre-placement inspection services.
   3. Do not proceed with concrete placement until conditions unacceptable to the Hydrophobic Concrete Admixture Manufacturer are corrected.

B. Suitable Condition of Reinforcing Steel:
   1. At the time concrete is placed, reinforcement shall be free from mud, oil, or other nonmetallic coatings that decrease bond. Epoxy-coating of steel reinforcement in accordance with standards shall be permitted.

2. Except for prestressing steel, steel reinforcement with rust, mill scale, or a combination of both shall be considered satisfactory, provided the minimum dimensions (including height of deformations) and weight of a hand-wire-brushed test specimen comply with ASTM A615, ASTM A706, ASTM A996.

3.03 INSTALLATION

A. Waterstops and groutable hose waterstop system components: Install in accordance with Hydrophobic Concrete Admixture Manufacturer's recommendations and the drawings.
   1. Bentonite waterstops:
      a. Shall be placed at all cold joints and penetrations
      b. Preparation:
         1) Brush off all dust and debris and apply a coat of primer or spray adhesive to the area where the waterstop is to be placed on the standing structural member.
         2) Using moderate hand pressure press a continuous bead of waterstop firmly into position on the standing structure. Check to be certain that the waterstop has bonded to the primed area.
         3) For proper joining, cut ends with sharp tool at 45 degree angle, and then place ends over one another
         4) Peel the protective backing from the exposed side of the waterstop. Knead the overlapped ends together to form continuous, uninterrupted gasket.
         5) For shotcrete applications, in addition to the instructions above, utilize masonry nails to hold the waterstop in place.on the concrete. Masonry nails should be spaced approximately 12 inches apart. Waterstop must be glued and tied with the use of tie wires to all penetrations.
      c. Bentonite waterstops must not be installed more than 2 days prior to concrete placement. After installation of waterstops, cover the waterstop with a plastic sheet to protect from weather damage.
      d. Bentonite waterstops shall be dry and not activated when concrete is placed. If the waterstops have been water damaged they shall be replaced before the concrete is placed.
   2. Other waterstops and groutable hose waterstop systems:
      a. Shall be placed as on drawings and as per Hydrophobic Concrete Admixture Manufacturer's recommendations

B. Additional Reinforcement at Re-entrant Angles
   1. Where re-entrant angles occur, three #4 or #5 bars spaced at 3 inches OC at least 3 feet long must be placed top and bottom at 90 degrees across all the angles.

C. Concrete: Place, consolidate, and cure concrete in accordance with ACI 301, ACI 306, ACI 308, and ACI 309.

D. Closure: Contractor shall allow Hydrophobic Concrete Admixture Manufacturer access to concrete after concrete placement to allow for closure. Hydrophobic Concrete Admixture Manufacturer shall advise Contractor when each area of waterproof concrete is available for finishing.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: A representative of the Hydrophobic Concrete Admixture Manufacturer will be present to observe, inspect, and approve the placement of concrete containing Hydrophobic Concrete Admixture Manufacturer's products.

B. The Contractor shall notify the Hydrophobic Concrete Admixture Manufacturer field representative at least 3 days prior to placement.

3.05 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.
   1. Apply evaporation reducer (ACI 308) on flatwork immediately after finishing, as needed to maintain a film of water on the surface of the finished concrete until the final curing is applied, anytime the evaporation rate exceeds 0.10 lbs./sq.ft./hr.

2. Apply curing compound immediately to finished or stripped surfaces. A wax- or resin-based curing compound should be used if there is no subsequent finish on the structure. If there is a subsequent finish, a water-based curing compound should be used.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

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 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.03 RELATED REQUIREMENTS

A. Section 01 4533 - Special Inspections: Code required special tests and inspections.

B. Section 03 3000 - Cast-in-Place Concrete.

1.04 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI SP-66 - ACI Detailing Manual; 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

E. CRSI (DA4) - Manual of Standard Practice; 2009.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, location of splices, and mechanical splices and connections. Show additional reinforcing required to hold reinforcing in place.

C. Plans shall be at 1/8" = 1'-0" or larger scale.

D. Shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings and shop drawings that have not been reviewed by the general contractor will be returned without review by the architect/engineer.

E. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.
   1. Maintain one copy of each document on project site.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Deformed Bar Anchors: Deformed Bar Anchors, A496 or A1064, minimum yield strength 75 KSI

C. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. Mesh Size and Wire Gage: As indicated on drawings.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide plastic components for placement within 1-1/2 inches of weathering surfaces.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing 125% of the full steel reinforcing design strength in tension and compression.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

D. Deformed Bar Anchors: The anchors are welded to plates in accordance with Chapter 7 of AWS D1.1, using a stud welding gun. Do not fillet weld deformed bar anchors.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete beyond the tolerances noted below.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Welded wire fabric shall have lapped splices made so that the overlap measured between the outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches.

D. Do not displace or damage vapor barrier.

E. Accommodate placement of formed openings.

F. Conform to drawings for concrete cover over reinforcement.

G. Placement Tolerances: Bars should be placed to the following tolerances:Concrete cover to formed surface: plus or minus 1/4 inch; Minimum spacing between bars: 1/2 inch; Crosswise of members: plus or minus 2 inches; Lengthwise of members: plus or minus 2 inches. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval by the Architect/Engineer.

H. Grouting of dowels into existing concrete shall be done with cement based non-shrink grout mixed and installed as required by the manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 4533 - Special Inspections, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete shear walls, elevator shaft walls, and foundation walls.

E. Concrete footings, grade beams, foundation walls and site retaining walls.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads, thrust blocks, and manholes.

H. Post-installed anchors

I. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 01 4533 - Special Inspections: Code required special tests and inspections.

B. Section 03 2000 - Concrete Reinforcing.

C. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

D. Section 09 0561 - Common Work Results for Flooring Preparation: Remediation of slabs with excessive moisture or pH.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2016.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting; 2010.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 308R - Guide to External Curing of Concrete; 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete; 2019, with Errata (2021).

J. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

K. ACI 355.2 - Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary; American Concrete Institute; 2007

L. ACI 355.4 - Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary; American Concrete Institute; 2011

M. ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete; 2017a.

N. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

O. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2021a.

P. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

Q. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

R. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021b.

S. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

T. ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete; 2017.

U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

V. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

X. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

Y. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2014.

Z. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.

AB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

AC. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

AD. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

AE. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete; 2012.

AF. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2017.

AG. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

AH. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

AI. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

AJ. ASTM C 1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012

AK. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

AL. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

AM. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

AN. NSF 61 - Drinking Water System Components - Health Effects; 2020.

AO. NSF 372 - Drinking Water System Components - Lead Content; 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section. At least the following shall be in attendace at the meeting: Contractor's superintendant, testing agency responsible for concrete mix design, ready mix concrete manufacturer, concrete subcontractor,

floor finishing subcontractor, independent testing agency, special inspector, architect engineer construction administrator, and the structural engineer of record.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix designs.
   1. Indicate proposed mix designs complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Submit mix design for each concrete mix including test results documenting average compressive strength in accordance with ACI 301. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Include manufacturer's data for admixtures included in the mix. Include suppliers data and tests for aggregates and cementitious materials including portland cement, fly ash, and ground granulated blast-furnace slag as applicable.
      a. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Test Reports: Submit report for each test or series of tests specified.

F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

H. Concrete delivery ticket: Submit a sample concrete delivery ticket in accordance with the requirements of ANSI/ASTM C94-03a "Standard Specification for Ready-Mix Concrete."

I. Concrete test results: Submit copies of all concrete test results signed by the testing laboratory.

J. Concrete Installers and Finishers Qualifications: Submit documentation for ACI certification for concrete flatwork finishers.

K. Testing Agency Qualifications: Submit qualifications for testing laboratory including certification for field testing technicians and laboratory testing technicians.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain at least one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Testing Agency Qualifications: an independent testing and inspection lab, acceptable to the Architect/Engineer, shall perform specified tests and inspections. The testing lab shall be qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

E. Concrete Installers and Finishers Qualifications: Concrete flatwork shall be performed utilizing high quality techniques conforming to American Concrete Institute Standards in ACI Publication CP-10, Concrete Flatwork Technician and Flatwork Finisher, and ACI Publication CCS-1, Concrete Craftsman Series, Slabs on Grade.

1. All concrete placing and finishing shall be performed by a crew lead by at least one ACI certified Concrete Flatwork Finisher or ACI certified Advanced Concrete Flatwork Finisher.

F. Concrete Manufacturer: Furnish concrete from a plant complying with the requirements of ASTM C94, Sections 8 & 9 with a current certificate from the National Ready Mixed Concrete Association.

G. Mix Design Engineer: Licensed to practice engineering in the state where the project is located with a minimum of 3 years experience in preparing concrete mix designs.

H. Cooperate with the Testing Agency and any special inspectors and provide them with free access to the work.

I. The testing agency shall verify the correct concrete mix design is being provided at the ready mix plant prior to going to the job site.

J. For floor slabs, verify concrete admixtures and sealants used are compatible with the applicable designated floor coverings and adhesives.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R 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. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface. Match existing shape of exposed concrete panels.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 2000 - Concrete Reinforcing.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33, Class 3M.
   1. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. Stockpile aggregates in a manner that will prevent segregation or contamination with other materials or other size aggregates. Alkali-Silica Reactive (ASR) aggregates are not allowed.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: Potable, clean and not detrimental to concrete, conforming to ASTM C 1602/C1602M.

2.04 ADMIXTURES

A. Chemical Admixture:
   1. Manufacturers:
      a. Euclid.
      b. Sika.
      c. WR Grace.
      d. BASF Masterbuilders.

e. Substitutions: See Section 01 6000 - Product Requirements.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Air Entrainment Admixture: ASTM C260/C260M.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

H. Accelerating Admixture: ASTM C494/C494M Type C.

I. Retarding Admixture: ASTM C494/C494M Type B.

J. Water Reducing Admixture: ASTM C494/C494M Type A.

K. Store admixtures to avoid contamination, evaporation, or damage. Protect liquids from freezing or other adverse temperatures. Agitate all admixtures used in form of suspension or non stable solutions prior to use. Follow manufacturer's directions.

L. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Complying with ASTM E1745, Class A; with a water vapor permeance ratings of 0.004 perms or less when tested in accordance with ASTM E 154 and stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
      a. Where void forms are used, use tape which also mechanically bonds the vapor retarder to the bottom of the concrete slab, per the manufacturer's instructions.
   2. Products:
      a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
      b. Stego Industries, LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
      c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
      d. Viaflex, Inc.; VaporBlock VB15: www.viaflex.com
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
   3. Flowable Products:
      a. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarproducts.com/#sle.
      b. US MIX Co.; US Spec MP Grout: www.usspec.com .
      c. Master Builders Solutions; MasterFlow 928: www.buildingsystems.basf.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   4. Low-Slump, Dry Pack Products:
      a. Five Star Products, Inc; Five Star Grout: www.fivestarproducts.com/#sle.
      b. US MIX Co.; US Spec MP Grout: www.usspec.com .
      c. Master Builders Solutions; MasterFlow 100: www.buildingsystems.basf.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

C. Capillary Water Barrier/Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing a No. 8 sieve.

D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

E. Post-Installed Anchors
   1. Mechanical Anchors: Tested and qualified for use in accordance with ACI 355.2 and ICC-ES AC193 for cracked and uncracked concrete recognition. Acceptable products include:
      a. SIMPSON STRONG-TIE "TITEN-HD" and "TITEN HD ROD HANGER" (ICC-ES ESR-2713)
      b. SIMPSON STRONG-TIE "STAINLESS STEEL TITEN-HD" (IAPMO UES ER-493)
      c. SIMPSON STRONG-TIE "STRONG-BOLT 2" (ICC-ES ESR-3037)
      d. HILTI "KWIK HUS-EZ" and "KWIK HUS-EZ I" SCREW ANCHOR (ICC-ES ESR-3027)
      e. HILTI "KWIK BOLT-TZ" EXPANSION ANCHOR (ICC-ES ESR 1917)
      f. HILTI "HDA UNDERCUT" (ICC-ES ESR-1546)
      g. HILTI "HSL-3" EXPANSION ANCHOR (ICC-ES ESR-1545)
      h. DEWALT "POWER-STUD+ SD1" (ICC-ES ESR-2818)
      i. DEWALT "POWER-STUD+ SD2, SD4 or SD6" (ICC-ES ESR-2502)
      j. DEWALT "SCREW-BOLT+" (ICC-ES ESR-3989)
      k. DEWALT CCU+ (ICC-ES ESR 4810)
      l. DEWALT SNAKE+ (ICC-ES ESR 2272)
      m. DEWALT MINI UNDERCUT+ (ICC-ES ESR 3912)
      n. DEWALT HANGER-MATE+(ICC-ES ESR 3889)
   2. Adhesive Anchors: Tested and qualified for use in accordance with ACI 355.4 and ICC-ES AC308 for cracked and uncracked concrete recognition. Acceptable products include:
      a. SIMPSON STRONG-TIE "SET-3G" (ICC-ES ESR-4057)
      b. SIMPSON STRONG-TIE "AT-XP" (IAPMO UES ER-263)
      c. HILTI "HIT-HY 200 SAFESET FAST CURE" (ICC-ES ESR-3187)
      d. HILTI "HIT-RE 500-SD SLOW CURE" (ICC-ES ESR-2322)
      e. DEWALT "AC200+" (ICC-ES ESR-4027)
      f. DEWALT "PURE 110+" (ICC-ES ESR-3928)
      g. Steel anchor element shall be Hilti HAS-E, ASTM F1554 Grade 36, or ASTM A193, Grade B6, B8, or B8M continuously threaded rod.
   3. Substitution requests for products other than those specified shall be submitted by the Contractor to the Architect Engineer along with calculations that are prepared and sealed by a registered professional engineer licensed in the State in which the project is located. The calculations shall demonstrate that the substituted product is capable of achieving the pertinent equivalent performance values (minimum) of the specified product using the appropriate design procedures and/or standard(s) as required by the building code.

F. Steel-Reinforced Plastic Trowel Blades for use at Decorative Exposed Surfaces.
   1. Manufacturers:
      a. Wagman Metal Products; Poly Pro reinforced trowel blades; www.wagmanmetal.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

C. PVC Waterstops: Complying with COE CRD-C 572.
   1. Configuration: For applications where exterior final grade is less than 4'-0" above the base of the wall, provide a minimum 4 inch wide waterstop. Where final grade is greater than 4'-0" above the base of the wall, provided a minimum 6 inch wide waterstop.
   2. Products:

a. BoMetals, Inc; RCB-4316 / RCB-6316: www.bometals.com/#sle.
b. Sika; Greenstreak 701 / 703.
c. Substitutions: See Section 01 6000 - Product Requirements.

D. Hydrophilic Waterstops: Rectangular or trapezoidal strips manufactured from butyl rubber with sodium bentonite or other hydrophilic polymers, complying with NSF 61 and NSF 372.
1. Configuration: For concrete elements less than 8 inches in width, provide 3/4 inch by 3/8 inch continuous strips. For concrete elements 8 inches and greater in width, provide a minimum 3/4 inch by 3/4 inch continuous strip.
2. Products:
a. TREMCO Superstop
b. W. R. Meadows Waterstop EC
c. CETCO Waterstop-RX
d. Sika Swellstop
e. Substitutions: See Section 01 6000 - Product Requirements.

E. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
1. Size: As indicated on drawings.

F. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.

G. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
1. Products:
a. W. R. Meadows, Inc; Speed-E-Joint: www.wrmeadows.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

H. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
1. Provide removable or non-removable plastic cap based on slab exposure, floor finish and manufacturer's recommendations. Removable plastic caps shall form a minimum 3/8" wide bd 1/2" deep void for sealant.
2. Height: To suit slab thickness.

I. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95, according to ASTM D 2240.

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
1. Products:
a. Dayton Superior Corporation; AquaFilm: www.daytonsuperior.com/#sle.
b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
c. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
d. W. R. Meadows, Inc ; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
1. Application: Use only at slabs scheduled to receive stain.
2. Product dissipates within 4 to 6 weeks.
3. Verify compatibility with final finish.

C. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.

1. Application: Use at concrete slabs exposed in final construction but not scheduled to receive polishing or stain and not subject to wheel traffic such as forklifts or pallet jacks.
2. A minimum of 2 coats are required. The first coat for curing and the second coat for sealing after all construction debris is removed.
3. Vehicle: Solvent-based.
4. Solids by Mass: 25 percent, minimum.
5. VOC Content: Ozone Transport Commission (OTC) compliant.

D. Penetrating Liquid floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
1. Application: Use at concrete slabs exposed in final construction and subject to wheel traffic such as forklifts or pallet jacks.
2. Manufacturers:
   a. Conspec Marketing & Manufacturing Co; Intraseal
   b. Curecrete Distribution Inc.; Ashford Formula
   c. Euclid Chemical Company; Euco Diamond Hard
   d. L&M Construction Chemicals, Inc.; Seal Hard
   e. Meadows, W.R., Inc.; Liqui-Hard
   f. Nox-Crete Products Group, Kinsman Corporation; Duro-Nox
   g. US Mix Products Company; Industraseal
   h. Master Builders Solutions; MasterKure HD 200 WB

E. Moisture-Retaining Sheet: ASTM C171.
1. Regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

F. Water: Potable, not detrimental to concrete.

2.08 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 field experience or trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Archtiect Engineer for preparing and reporting proposed mix designs.
2. Test reports verifying the concrete strength must be submitted with mix designs for approval.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. For floor slabs, verify components of mix design are compatible with the flooring materials and adhesives.

E. Normal Weight Concrete:
1. Water-Cement Ratio: As indicated in Concrete Mixture Schedule.
2. Air Content, when determined in accordance with ASTM C231: As indicated in Concrete Mixture Schedule for mixes where Air-entrainment is required.
3. Maximum Slump: As indicated in Concrete Mixture Schedule before the addition of any water reducing admixture, but no more than 8 inches after the addition of any water reducing admixture. Higher slumps may be acceptable in self consolidating concrete or flowing concrete applications with the approval of the Architect Engineer.
4. Maximum Aggregate Size: As indicated in Concrete Mixture Schedule.
5. Fly Ash Content: Fly Ash shall not be used in concrete for slabs. Maximum 25 percent of cementitious materials by weight for other concrete.
6. Water-Cement Ratio: As indicated in Concrete Mixture Schedule.
7. Maximum Aggregate Size: As indicated in Concrete Mixture Schedule.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

C. Mixing Time: Mix and place concrete within 1 1/2 hours of initial batching of the concrete. When the air temperature is between 85 and 90 degrees F reduce the maximum time between batching and placing the concrete to 75 minutes. When the air temperature is above 90 degrees F reduce the batching and placing time to 60 minutes. Longer mix times may be possible with the use of appropriate admixtures but only with written approval of admixture manufacturer(s) and Architect/Engineer.

D. Addition of Water at Job Site: Unless the delivery ticket states the amount of water that can be added without exceeding the design water cement ratio and the slump of the mix, water cannot be added at the job site. Addition of water above the design water/cement ratio shall be cause for rejection of the concrete.

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. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete. Chamfer exterior corners and edges of permanently exposed concrete. Comply with Division 1 requirements for certified wood used for formwork and disposal of construction waste.

C. Verify that forms are clean and free of rust before applying release agent.
   1. Where as-cast finishes are required do not use materials on the face of the form that will impart a stain to the concrete. Where the finished surface is required to be coated, the material applied to the form surfaces shall be compatible with the type of coating to be used.

D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

F. Interior Slabs: Install vapor retarder under interior slabs per ASTM E 1643 and the manufacturer's written instructions. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Use manufacturer's recommended pipe boot and tape to seal vapor retarder to all pipes, conduits, and other elements that penetrate slabs-on-grade. Repair damaged vapor retarder before covering per manufacturer's instructions. Where slab is poured over void forms, mechanically bond the vapor retarder to the undeside of the slab with textured tape per manufacturer's instructions.
   1. Extend vapor retarder over footings and seal to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments such as water stops or dowels. Seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter.

2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

A. Do not add water to concrete during delivery at Project site unless amount that can be added without exceeding the water/cement ratio is stated on the delivery ticket. If water is allowed to be added it must be introduced and mixed inside the transit mixer drum for 5 minutes or 70 revolutions before the concrete leaves the truck.

B. Place concrete in accordance with ACI 304R.
   1. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Do not use vibrators to transport concrete inside of forms.

C. Place concrete for floor slabs in accordance with ACI 302.1R.
   1. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel of section is complete. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

D. Notify Architect Engineer not less than 24 hours prior to commencement of placement operations.

E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

F. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

G. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

I. Cold Weather: When the temperature is below 40 degrees F maintain concrete temperature between 50 and 70 degrees F for the required curing period. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt, or other materials containing antifreeze agents. Do not use chemical accelerators unless approved by the Architect/Engineer and included in the mix designs. Follow recommendations of ACI 306R.

J. Hot Weather: When the temperature is over 85 degrees F, maintain the concrete below 90 degrees F at the time of placement. Make arrangements for installation of windbreaks, shading, fog spraying, sprinkling, ponding, or other protective measures to protect the concrete. Fog spray forms, steel reinforcement, and subgrade just before placing concrete. Keep the subgrade uniformly moist without standing water, soft spots, or dry areas. Follow recommendations of ACI 305R.

3.04 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
   1. Form weakened-plane contraction joints in layout indicated. Provide keyed joints at construction joints and where indicated. Other joints may be keyed joints or sawn joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
   1. Saw joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints in concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant. Install per manufacturer's recommendations.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect finished slabs for conformance to specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 JOINTS - OTHER THAN SLABS

A. General: Construction joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect/Engineer.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated or at 20 foot maximum on center if not indicated.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.07 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints where indicated to form a continuous diaphragm. Install in longest lengths practical. Support and protect waterstops during progress of the work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practical.

3.08 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

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.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Light steel-troweled" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   3. Decorative Exposed Surfaces: "Normal steel-troweled" as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to be polished, and all other slab surfaces.
   4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, unless noted otherwise, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.09 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 seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Slabs scheduled to receive Adhesive-Applied Flooring or other moisture sensitive flooring: Slab shall be cured by being covered with moisture retaining sheets (curing paper, polyethylene, or a combination of the two) for 3 to 7 days. Slabs shall not be cured by adding water. Curing compounds are not allowed.
   1. Floor slabs shall meet the requirements of Section 090561 prior to installation of floor coverings.

E. Slabs scheduled to receive stain: Curing shall be accomplished by damp curing, sheet curing, or a dissipating curing compound compatible with the stain system.

F. Slabs on grade exposed in final construction, not subject to wheel traffic (such as forklifts or pallet jacks) and not scheduled to receive stain: Curing shall be by a curing and sealing compound.
   1. Curing and sealing compound: Apply uniformly to floors and slabs in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during the curing period. Clean the top of the slab and provide a final coat to seal the slab before the final acceptance by the owner.

G. Slabs on grade exposed in final construction and subject to wheel traffic (such as forklifts or pallet jacks): The floor shall be sealed with a penetrating liquid floor treatment. Curing shall be accomplished by damp curing, sheet curing, or a dissipating curing compound compatible recommended by the penetrating liquid floor treatment. Preparation of the slab and application of the penetrating liquid floor treatment shall be per the manufacturer's instructions.

H. Protection of work: Protect all work from damage from concreting operations. Protect completed concrete as follows:
   1. Finished Surfaces: Protect from damage from rain. Keep surfaces clean and free from oil, grease, dirt, or other foreign matter and protect from damage by construction equipment,

materials, etc. Do not permit heavy traffic on finished floor for a minimum of 7 days after it is placed. Install barriers and if necessary maintain a watchman to enforce this requirement. Do not cut pipe on slabs to be exposed in final construction. Diaper all equipment working over slabs to receive stain to prevent oil leakage.

2. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

3.10 REMOVAL AND REUSING FORMS

A. Removal of forms:
   1. Formwork not supporting the weight of the concrete, such as sides of beams, walls, column, and other similar part of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided the concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
   2. Formwork supporting the weight of the concrete, such as beam, soffits, and slabs, may not be removed in less than 14 days after the concrete is placed and until concrete has attained 80 percent of its minimum compressive strength at 28 days.

B. Reusing forms:
   1. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.
   2. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Architect/Engineer.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as here-in specified, to blend with in-place construction.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases And Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnished machines and equipment.

D. Steel Column Base Plates: Grout base plates and foundations as indicated on drawings using specified non-metallic non-shrink grout. Us flowable grout for column base plates.

E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces with light broom finish.

F. Post-installed anchors:
   1. Shall only be used where specified on the construction documents. The contractor shall obtain approval from the Architect/Engineer prior to installing post-installed anchors in place of missing or misplaced cast-in-place anchors.
   2. Care shall be taken in placing post-installed anchors to avoid conflicts with existing rebar.
   3. Hole shall be drilled and cleaned in accordance with the manufacturer's written instructions.
   4. Provide continuous or periodic inspection for all adhesive and mechanical anchors per the product's applicable ICC-ES Evaluation Report (ICC-ES ESR) OR IAPMO UES EVALUATION REPORT (IAPMO UES ER).

5. Contact manufacturer's representative for the initial training for installation of and for product related questions and availability. Call SIMPSON STRONG-TIE at (800) 999-5099. Call HILTI at (800) 423-6587. Call DEWALT at (800) 524-3244.
6. The contractor shall arrange an anchor manufacturer's representative to provide on-site installation training for all of their anchoring products specified.The Architect Engineer must receive documented confirmation that all of the contractor's personnel who install anchors are trained prior to the commencement of installing anchors.

3.12 JOINT FILLER

A. Slab on Grade Control Joint Filler: At keyed construction joints, sawn joints, and tooled joints fill the control joint as follows:
   1. Slabs exposed to view in final construction: Remove the cap at keyed control joints, clean the joint and fill the void with semi-rigid joint filler. Install in accordance with manufacturer's written instructions.
   2. Slabs to be covered with tile: Remove the cap at keyed control joints, clean the joint, and fill the joint and any spalls or other slab imperfections with non-shrink grout or a concrete patching material a minimum of 56 days after the slab has been poured.
   3. Slabs to be covered with carpet: Leave the cap at keyed control joints. Do not fill the joint except where the joint is greater than 1/8" in width and as required to fill spalls and other imperfections in the slab that may damage or show through the carpet. Clean the spall and joint in those areas and fill with non-shrink grout or a concrete patching material.

3.13 FIELD QUALITY CONTROL

A. An independent testing agency shall perform field quality control tests, as specified in Section 014533 - Special Inspections.

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 inspection and testing firm for review prior to commencement of concrete operations.

D. The testing agency shall verify the correct concrete mix design is being provided at the ready mix plant prior to going to the job site.

E. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

F. Concrete Test Samples: Samples for acceptance tests on concrete shall be obtained in accordance with ASTM C172C172M.

G. Compressive Strength Tests: ASTM C39/C39M.
   1. Make and cure test specimen in accordance with ASTM C31/C31M.
   2. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cu yd of concrete, nor less than once for each 5000 sq ft of surface area for slabs or walls
   3. A strength test shall be the average of the strengths of at least two 6 by 12 in. cylinders or at least three 4 by 8 in. cylinders made from the same sample of concrete and tested at 7 and 28 days. Test additional cylinders at 56 days if the average 28 day strength is less than the specified design strength.
   4. Take one additional test cylinder set during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

I. Perform one air content test in accordance with ASTM C231C231M for each strength test of concrete.

J. Determine temperature of concrete sample for each strength test in accordance with ASTM C1064/C1064M.

K. Determine density (unit weight) and yield of concrete sample for each strength test in accordance with ASTM C138/C138M.

3.14 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect Engineer for each individual area.

E. Repair of Formed Surfaces: Surface defects include color and texture irregularities, crack, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact with patching mortar before the bonding agent has dried. Remove and replace concrete defective surfaces if defects cannot be repaired to satisfaction of Architect/Engineer.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surfaced plan to tolerances specified for each surface and finish. Correct high areas by grinding after concrete has cured at least 14 days. Correct low areas immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.

3.15 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.16 CONCRETE MIXTURE SCHEDULE

A. Use: Lean Concrete Fill under Footings.
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 1000

B. Use: Footings / Mat Slabs
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 5000
   2. Aggregate Size Maximum, inches (Note: 1): 1-1/2
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.45 (0.40 at slabs with floor coverings)
   5. Air Content, percent: None

C. Use: Reinforced Walls and Grade Beams
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 5000
   2. Aggregate Size Maximum, inches (Note: 1): 1-1/2
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.45
   5. Air Content, percent: 5.5

D. Use: Interior Slab-on-Grade
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 5000
   2. Aggregate Size Maximum, inches (Note: 1): 1
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.45 (0.40 at slabs with floor coverings)
   5. Air Content, percent: None

E. Use: Exterior Slabs and Pads
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 4500
   2. Aggregate Size Maximum, inches (Note: 1): 1
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.45

5. Air Content, percent: 6
6. Floor/Slab Finish: Broom finish

F. Notes:
1. Maximum size of coarse aggregates: Comply with ACI 301 for minimum clearance between reinforcing bars, sides of forms, and slab or topping thickness (except in unbonded topping maximum aggregate size shall not exceed one-quarter topping thickness).
2. Air Content, when determined in accordance with ASTM C231: As indicated in Concrete Mixture Schedule for mixes where Air-entrainment is required.
3. Maximum Slump: As indicated in Concrete Mixture Schedule before the addition of any water reducing admixture, but no more than 8 inches after the addition of any water reducing admixture. Higher slumps may be acceptable in self consolidating concrete or flowing concrete applications with the approval of the Architect Engineer.

END OF SECTION

SECTION 03 3511
CONCRETE FLOOR FINISHES

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.04 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet square.

C. Locate where directed and may remain as part of final work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.06 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. SLC-01: Aliphatic Urethane Clear Sealer:
   1. Use at the following locations: All locations SLC-01 in finish schedule.

2.02 COATINGS

A. Clear Topical Sealer:
   1. Composition: Aliphatic Urethane- Single Component - Clear.
   2. Products:
      a. Elite Crete: AUS-50: www.elitecrete.com
      b. Euclid Chemical Company: www.euclidchemical.com
      c. Sika Corporation: www.sikausa.com
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Accessories:
   1. Primers.
   2. Cleaning agents.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Remove all construction dirt, debris, staining, paint, sealants, mastic, drywall joint compound, etc. from surface of concrete to provide a blemish free surface. Physical and mechanical cleaning required; chemical cleaning may be necessary upon approval only. The use of light sanding and/or polish grinding is acceptable at hard to clean surfaces.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply primers and coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2018.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2023.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

L. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

N. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2020.

O. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.

P. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2023b.

R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.04 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Types as scheduled in this section.
   2. Color: Mineral pigments added as required to produce approved color sample.
   3. Manufacturers:
      a. Substitutions: See Section 01 6000 - Product Requirements.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

C. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Standard gray.

D. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.

E. Blended Masonry and Portland Cement Grout: ASTM C476.

F. Packaged Dry Mortar: ASTM C387/C387M, Type N or S, using gray or white color cement as required to achieve desired mortar color.

G. Hydrated Lime: ASTM C207, Type S.

H. Quicklime: ASTM C5, non-hydraulic type.

I. Mortar Aggregate: ASTM C144.

J. Grout Aggregate: ASTM C404.

K. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).
   2. Manufacturers:
      a. Davis Colors: www.daviscolors.com/#sle.
      b. Lambert Corporation: www.lambertusa.com/#sle.
      c. Solomon Colors: www.solomoncolors.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

L. Water: Clean and potable.

M. Bonding Agent: Latex type.

N. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
   1. Performance of Mortar with Integral Water Repellent:
      a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         1) No water visible on back of wall above flashing at the end of 24 hours.
         2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         3) No more than 25 percent of wall area above flashing visibly damp at end of test.
      b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
      d. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
   2. Use only in combination with masonry units produced with integral water repellent admixture.

2.03 MORTAR MIXES

A. Ready Mixed Mortar: ASTM C1142, Type RN.

B. Mortar for Unit Masonry: ASTM C270, Property Specification.

2.04 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

2.05 GROUT MIXES

A. Bond Beams, Lintels, and Reinforced Cells: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.

2.06 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

C. Perform practices for cold or hot weather requirements.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 60 inches maximum for fine and course grout with 2 inches maintained clearances around reinforcing. Refer to structrual drawings for additional restrictions.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FINAL TOUCH UP

A. CLEANING: Clean mortar from masonry or masonry veneer to observe mortar color tone / consistency.

B. Stain surface of exposed mortar as required where discoloration of mortar appears from field tone/color. Repeat as necessary to obtain consistent color tone. Coordinate locations requiring staining with architect.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

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 SECTION INCLUDES

A. Structural steel framing members.

B. Base plates, shear stud connectors.

C. Grouting under base plates.

1.03 RELATED REQUIREMENTS

A. Section 014533 - Special Inspections: Code required special tests and inspections.

1.04 REFERENCE STANDARDS

A. ANSI/AISC 360 - Specification for Structural Steel Builidngs; American Institute of Steel Construction, Inc.; 2010

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2010

C. AISC Detailing for Steel Construction, Third Edition; 2009

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

H. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2020.

K. ASTM A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS); 2013.

L. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

M. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2018.

N. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

O. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

P. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

R. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

T. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with Errata (2015).

U. US Government Department of Labor; Occupational Safety and Health Administration; 29 CFR Part 1926, Safety Standards for Steel Erection.

V. SSPC-SP 3 - Power Tool Cleaning; 2018.

W. Specification for Structural Joints Using High Strength Bolts, Research Council on Strucutral Connnections; 2009.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections.
   3. Connections not detailed. Include analysis data signed and sealed by the qualified professional engineer responsible for their preperation.
   4. Indicate cambers.
   5. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   6. Plans shall be at 1/8" = 1'-0" or larger scale.
   7. Contractor shall require the detailer to thoroughly check and back-check all shop drawings before sending for approval, as described in ASIC Detailing for Steel Construction, Chapter 8. Incomplete and/or unchecked shop drawings will be returned without review by the Architect/Engineer.
   8. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.
   9. When there are more than 100 sheets of structural steel shop drawings contractor shall submit the shop drawings in sequences so that each of the submittals do not exceed 100 sheets. Divide the sequences to match the erection sequence of the building. Submit the applicable columns, erection plans, and details with each sequence.
   10. Typical details are indicated on the drawings. Details for some special conditions will need to be developed by the detailer during the detailing process. The details will be reviewed during the review process. Final approval of the details will be at the discretion of the engineer of record. No additional charges for making corrections or changes to the shop drawings (redetailing costs) or for miscellanuous fabricated material will be allowed. Steel contractor shall make provisions for detailing corrections and miscellanous material in the bid price. Adjustments to the contract will only be made for change orders approved prior to the commencement of any action on the changes.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Testing and Inspection Laboratory qualifications.

1.06 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."

B. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Testing and Inspection Agency Qualifications: an independent testing and inspection lab, acceptable to Architect/Engineer, shall perform specified tests and inspections. The testing lab shall be qualified according to ASTM C 1077 and ASTM E 329 for testing indicated as documented according to ASTM E 548. See Section 014533.

E. Fabricator shall design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located. All connections shall be shown in the shop drawings and are subject to the approval of the Architect/Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel W Shapes, C Shapes, MC Shapes, and WT Shapes: ASTM A992/A992M.

B. Steel M Shapes, S Shapes, HP Shapes, MT Shapes, ST Shapes, Angles, Plates, and Bars: ASTM A572/A572M Grade 50.

C. Rectangular, Square, and Round Hollow Structural Sections: ASTM A500, Grade C or ASTM A1085

D. Pipe: ASTM A53/A53M, Grade B, Finish black.

E. Shear Stud Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Deformed Bar Anchors: A496 or A1064, minimum yield strength 75 KSI

G. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A.

H. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M , Grade A325 (A325M), Type 1, medium carbon, plain. Where load indicator bolts are indicated provide twist-off type assemblies conforming to ASTM F3125, Grade F1852.

I. Tension Control Bolts: Twist-off style; ASTM F3125/F3125M, Grade F1852.

J. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

L. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

M. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible. Shop fabrication shall be in accordance with OSHA Safety Standards for Steel Erection.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, or faying surfaces of a slip critical connection.

C. Galvanize structural steel members, where indicated, to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.04 SOURCE QUALITY CONTROL

A. Welded Connections: Visually inspect all shop-welded connections and test 100 percent of welds greater than 5/16" in thickness and all complete penetration welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" an in complicance with OSHA Safety Standards for Steel Erection.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on drawings.

D. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
   4. Where welds are exposed in the final construction, make fillet welds oversized and grind to uniform profile with smooth face and transition. Appearance of exposed welds shall be subject to the approval of the Architect.

E. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

F. Do not field cut or alter structural members without approval of Architect Engineer.

G. After erection, prime welds, abrasions, and surfaces not shop primed.

H. Galvanized Surfaces: After erection of galvanized steel clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780. Use a primer that matches the finish of the galanizing where the galvanized surface will be exposed in the final construction.

I. Grout solidly between column base plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Use only flowable grout prodcuts. See Section 03 30 00. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

J. Shear Stud Connectors: Fusion weld studs to plates or beams with a stud welding gun in accordance with Chapter 7 of AWS D1.1. Do not fillet weld studs.

K. Deformed Bar Anchors: Fusion weld anchors to plates with a stud welding gun in accordance with Chapter 7 of AWS D1.1. Do not fillet weld deformed bar anchors.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency acceptable to the Architect/Engineer shall perform field quality control tests, as specified in Section 01 45 33 - Special Inspections.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

C. Welded Connections: Visually inspect all field-welded connections and test field-welded connections as indicated in the Schedule of Special Inspections by Ultrasonic testing (UT) performed in accordance with ASTM E164.

D. Welds that fail testing shall be repaired and retested at contractor's expense. If a weld fails testing all previous untested similar welds by the same welder shall be tested.

E. High Strength Blind Bolted Connections: Visually inspect all high strength blind bolted connections.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Prefabricated ladders and ship ladders.

C. Metal Bar Grading.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections - Code required special tests and inspections.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

C. Section 05 5100 - Metal Stairs.

D. Section 05 5213 - Pipe and Tube Railings.

E. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2018.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

L. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A992 Grade 50 or ASTM A572 Grade 50.

B. Hollow Steel Sections: ASTM A500 Grade C or ASTM A1085.

C. Plates: ASTM A570 Grade 50.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

F. Welding Materials: AWS D1.1/D1.1M; 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 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Bolts, Nuts, and Washers: Stainless steel.

2.03 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.

2.04 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
   2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

D. Lintels: As detailed; prime paint finish.

E. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

F. Metal Bar Grating: Welded metal bar gratings conforming to ANSI/NAAM MBG 531 - Metal Bar Grating Manual by the Natinoal Association of Architectural Metal Manufacturers. Provide welded steel grating type W-19-4 galvanized after fabrication for use in areas not subject topublic traffic. Provide grating with bearing bar size indicated on drawings. If not indicated on drawings design grating to support applicable loads. Provide grating with a maximum clearance of 1/4 inch between bearing bars at all grating accessible to public or in exit corridors or exit stairs. In exit corridors and stairs, the 1/4 inch maximum clearance shall be parrallel to the direction of travel.
   1. Material: Steel
   2. Type: Welded
   3. Cross Bars: Rectangular
   4. Traffic Surface: Plain
   5. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.5 oz. per sq. ft. of coated surface.

6. Provide removalble grating sections with banding bars attached to welding to entire perimeter of each section.
7. Fasteners: Saddle Clips, minimum 4 per section with each clip designed and fabricated to fit over 2 bearing bars.

2.05 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; 2 (1), 6063 alloy, T52 temper.
   3. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.
   4. Manufacturers:
      a. Basis of Design: O'Keeffe's Inc: Model 531, Cage Ladder: www.okeeffes.com/sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in 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 A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

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 as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100

METAL STAIRS

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 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

1.03 RELATED REQUIREMENTS

A. Section 014533 - Special Inspections: Code required special tests and inspections.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 051200 - Structural Steel Framing: Quality Assurance; Support framing; Field Quality Control.

D. Section 05 5213 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

1.04 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

K. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Submit 2 copies of each shop drawing for approval. One checked copy will be returned to the Contractor who will then run and distribute all copies required.
3. Contractor shall require the detailer to thoroughly check all shop drawings before sending for approval. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings, unchecked drawings and shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.
4. Provide calculations for all contractor deligated design components. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

D. Designer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. See Section 051200 - Structural Steel Framing.

B. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
2. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
3. Dimensions: As indicated on drawings.
4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
b. Welds Exposed to View: Ground smooth and flush.
c. Mechanical Joints: Butted tight, flush, and hairline.
d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
e. Exposed Edges and Corners: Eased to small uniform radius.
f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.

1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
4. Concrete Reinforcement: Welded wire mesh.
5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
1. Nosing Depth: Not more than 1-1/4 inch overhang.
2. Nosing Return: Flush with top of concrete fill, not more than 1 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: As indicated on drawings.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: As indicated on drawings.

G. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: See Section 05 5213.

B. Guards: Pipe railings, see Section 05 5213.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation SS (structural steel), Grade 33.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation SS (structural steel), Grade 33, Type 1.

E. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized.

3.04 FIELD QUALITY CONTROL

A. See Section 051200 - Structural Steel Framing. An independent testing agency acceptable to the Architect/Engineer shall perform field quality control inspections and tests, as specified in Section 014533 Special Inspections.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5133
METAL LADDERS

PART 1 GENERAL V-UNDER CONSTRUCTION

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Prefabricated ladders.

1.02 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Designer's Qualification Statement.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

A. Design Ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

2.04 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
   3. Finish: Mill finish aluminum.
   4. Manufacturers:
      a. Industrial Ladder & Scaffolding, Inc.; _____: www.anyladder.com/#sle.
      b. O'Keeffe's Inc; Model 500: www.okeeffes.com/#sle.
      c. Precision Ladders, LLC; Fixed Alumnium Wall Ladder: www.precisionladders.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES:

A. Personal Fall Arrest System:
   1. Provide at all ladders with overall climbing height in excess of 23 feet.
   2. Lifeline bar, attachment brackets, cable guide and other required components for a complete working system.
   3. Provide Stainless Steel assemblies at exterior locations and Galvanized Steel at interior applications.
   4. Include two (2) harnesses for two different weight classes; 100-200 lbs and 200-300 lbs.
   5. Manufacturers:
      a. Honeywell Miller International Inc. ; Model VG: http://sps.honeywell.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

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 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Balcony railings and guardrails.

1.03 RELATED REQUIREMENTS

A. Section 014533 - Special Inspections: Code required special tests and inspections.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

C. Section 051200 - Structural Steel Framing: Quality Assurance; Field Quality Control

D. Section 05 5100 - Metal Stairs: Attachment plates for handrails specified in this section.

E. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.04 REFERENCE STANDARDS

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

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Submit 2 copies of each shop drawing for approval. One checked copy will be returned to the Contractor who will then run and distribute all copies required.

D. Contractor shall require the detailer to thoroughly check all shop drawings before sending for approval. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings, unchecked shop drawings and shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.

1.06 QUALITY ASSURANCE

A. See Section 051200 - Structural Steel Framing.

B. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.
   4. Posts: Provide adjustable flanged brackets.

E. Provide mechanical and welding fittings where indicated to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade C cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Steel Plates, Shapes and Bars: ASTM A36/A36M or ASTM A572/A572M.

D. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

E. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

F. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

G. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. 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.

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 items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 051200 - Structural Steel Framing. An independent testing agency acceptable to the Architect/Engineer shall perform field quality control inspections and tests, as specified in Section 014533 Special Inspections.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Roof-mounted curbs.

B. Roofing nailers.

C. Preservative treated wood materials.

D. Fire retardant treated wood materials.

E. Communications and electrical room mounting boards.

F. Concealed wood blocking, nailers, and supports.

G. Wall sheathing with factory applied water-resistive and air barrier sheet.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2021.

F. SPIB (GR) - Standard Grading Rules; 2021.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Installation fastener requirements and spacing.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.

B. Wall Sheathing at backside of parapets : Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
   1. To be used ast backside of parapets at locations where single-ply roofing membranes are installed. Coordinate with roofing manufacturer requirements.
   2. Manufacturers:
      a. Georgia-Pacific Gypsum; DensDeck Prime: www.gpgypsum.com/#sle.

C. Wall Sheathing (with factory applied Weather Barrier) : Glass mat faced gypsum with integral water-resistive and air barrier, ASTM C1177/C1177M, 5/8 inch thick.
   1. Edges: Square.
   2. Water Vapor Permeance: 1 perm, minimum, when tested in accordance with ASTM E96/E96M.
   3. Air Permeance, Assembly: 0.04 cfm per square foot, maximum, when tested in accordance with ASTM E2357.
   4. Fluid-Applied Flashing: Approved by sheathing manufacturer.
   5. Warranty:
      a. Exposure: Manufacturer's standard; 12 months, against exposure damage, and dated from installation of product.
      b. Defect: Manufacturer's standard; 5 years, against manufacturing defects, and dated from purchase of product.
   6. Manufacturers:
      a. Georgia-Pacific LLC; DensElement Barrier System: www.DensElement.com/#sle.
      b. Tremco Commercial Sealants & Waterproofing; Securock ExoAir 430 Panel: www.tremcosealants.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

E. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors: Use fasteners suitable for proper attachment to substrates and contain weatherized coating approved for use where exposed. Fasteners in treated lumber are required to have high corrosion resistance, compatible with chemical treatment and be approved for use by wood manufacturer.

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Sill Flashing: As specified in Section 07 6200.

C. Water-Resistive Barrier: For other locations, as specified in Section 07 2500.

D. Fluid Applied Weather Barrier Joint Treatment: Dens Defy Liquid Flashing.

E. Joint Transition Membane: Dens Defy Transition Membrane.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood (FRTW) : Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood (PTW): Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Treat rough carpentry items as indicated .
c. Do not use fire treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber in contact with roofing, flashing, or waterproofing.
c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. At building construction types I & type II, refer to code review statements on drawings, use fire-retardant treated wood FRTW where drawings indicate the use of wood for blocking, nailers or

furring at the following locations:
1. Exterior walls that are classified with fire resistance rating.
2. Interior fire resistance rated partitions.

C. At exterior walls, use pressure treated wood PTW for blocking.

D. At interior locations, blocking shall be standard wood unless noted otherwise.

E. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

F. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

G. Provide the following specific non-structural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Locations of termination bars for elements such as masonry flashing or roofing, etc.. Continuous plywood strips are permitted at exterior walls, in same thickness of wall sheathing, provided the exterior surface is field treated with fluid weather barrier product.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
1. Use fastener type and spacing as recommended by manufacturer to accommodate no less than structural design wind speed per structural plans.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

C. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs as recommended by manufacturer.
1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
3. Use compatible fluid applied weather barrier at transitions to adjacent materials.
4. Apply manufacturer's standard seam tape to joints between sheathing panels. Use tape gun or hard rubber roller as recommended by manufacturer.
5. Treatment of openings, penetrations, patches and repairs are per section 07 2500 weather barriers.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. BHMA A156.9 - Cabinet Hardware; 2020.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.

E. PS 1 - Structural Plywood; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of finish plywood, 8x8 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Plain sliced red oak; prepare for stain.

2.02 WOOD-BASED COMPONENTS

A. Provide sustainably harvested wood, certified or labeled as specified in Section 01 6000 - Product Requirements.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: _____ species, _____ sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.05 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

A. Lumber for Shimming, Blocking, and other concealed spaces: Softwood lumber of Southern Pine species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.08 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with aluminum trim.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

F. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 12 Polyurethane Water-based.

b. Stain: As selected by Architect.
c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install hardware in accordance with manufacturer's written instructions.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9123.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4216
WOOD-VENEER PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom wood veneer paneling.

B. Shop finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Grounds and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.

1.04 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2300 - Alternates, for product alternatives affecting this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fire retardant treatment materials and application instructions.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
   2. Include Plan of panel number sequencing.

D. Samples: Submit two samples of finished plywood, 8 x 10 inch in size, illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim, 6 inch long.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 MOCK-UP

A. Construct mock-up, 4 feet long by 4 feet wide, illustrating full panel sheet, edge trim, joint trim, applied finish , and other details..

B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

PART 2 PRODUCTS

2.01 PANELING

A. Quality Standard: Unless otherwise indicated provide products of qualirt specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.

B. Flat Paneling:
   1. Basis of Design: Shinnoki by Decospan; www.usa.shinnoki.com
   2. Species: Sahara Oak. 19 mm MDF with dark color melamine reverse (NCS S7500-N)..
   3. Panels: Veneer of full width and balanced sequence matched.

4. Visible Edges and Reveals: Edgebanded with matching .6m edgeband..
5. Outside Corners: Use aluminum "x" trim..

2.02 WOOD-BASED MATERIALS - GENERAL

A. Wood fabricated from old growth timber is not permitted.

B. Particleboard: Complying with ANSI A208; composed of wood chips, medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.03 ADHESIVES AND FASTENERS

A. Adhesives: Type suitable for intended purpose, complying with applicable air quality regulations.

B. Wood paneling mounting clips and trim:
   1. Basis of Design: Monarch Metal Fabrication: www.monarchmetal.com
   2. Extruded Aluminum Reveals and trim, 1/8 inch reveal max, in shapes and profiles as indicated on drawings and as follows.
      a. Mounting Z-Clip: MF375 2 inch Z-Clip attached to panels & continuous lengths attached to walls. Minimum 3 rows of clips per panel. Minimum 4 clips per row. Space per manufacturer's recommendation.
      b. Horizontal Reveal: EPS-H075-WC (3/4 inch panel).
      c. Edge/Perimeter: EPS-ET075-C (3/4 inch panel).
      d. Outside Corner: EPS-OC075-SM (3/4 inch panel).
      e. Finish: Clear annodized finish in concealed locations and clear annodized finish in exposed locations.
      f. Other acceptable manufacturer's include Fry Reglet Architectural Metals:www.fryreglet.com.
      g. Substitutions: See Section 01 6000-Product Requirements.

2.04 ACCESSORIES

A. Edgebanding: Pre-glued and non pre-glued .6mm and ABS 1.5mm thicknesses as appropriate for installation.

B. Lumber for Shimming, Blocking: Softwood lumber of Southern Yellow Pine species.

C. Primer: Alkyd primer sealer type.

D. Wood Filler: Tinted to match surface finish color.

E. Correction pens and lacquer pen: In colors to match selected surface.

2.05 FABRICATION

A. Prepare panels for delivery to site, permitting passage through building openings.

B. Finish exposed edges of panels as specified by grade requirements.

2.06 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. Acrylic - Polyurethane
      b. Sheen: Satin

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

3.03 ACCESSORIES

A. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

B. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 07 0553

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

D. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 9123 for products.

D. Languages: Provide all markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 9123 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 09 9123.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing system with drainage panels at below-grade foundations.
   1. Composite HDPE/Bentonite sheet membrane.

1.02 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

C. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 MOCK-UP

A. Construct mock-up consisting of 100 sq ft of horizontal waterproofed panel; to represent finished work including internal and external corners.

B. Locate where directed.

C. Mock-up may remain as part of this Work.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Composite HDPE/Bentonite Sheet Membrane:
   1. Vertical Surfaces: Mechanically attached.

2. Horizontal Surfaces: Mechanically attached.
3. Cover with drainage panel.

2.02 MEMBRANE MATERIALS

A. Composite HDPE/Bentonite Sheet Membrane: Comprised of black/gray HDPE and granular bentonite with spun polypropylene fabric facing.
   1. Thickness: 150 mils, 0.150 inch, minimum.
   2. Sheet Width: 4 feet, minimum.
   3. Bentonite: Granulated pure, dry, bentonite clay compromised of 90 percent minimum sodium montmorillonite; 90 percent minimum passing No. 20 mesh sieve and 10 percent maximum passing No. 200 mesh sieve.
      a. Minimum bentonite content: 1 lb/sq ft.
   4. With compatible waterstop devices and 4 inch (100 mm) wide rubberized asphalt seam tape.
   5. Tensile Strength: 4000 psi, measured in accordance with ASTM D412.
   6. Water Vapor Permeability: 2.7 x 10 -13 cm/sec or _ perm inch measured in accordance with ASTM E96/E96M.
   7. Manufacturers:
      a. CETCO, a division of Minerals Technologies Inc; ULTRASEAL: www.mineralstech.com/#sle.
      b. Epro Services, Inc; Bento-Pro Plus: www.eproserv.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing; Paraseal: www.tremcosealants.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealant for Substrate Surfaces: Type as specified in Section 07 9200.

B. Protection Board: Provide type capable of preventing damage to waterproofing due to backfilling and construction traffic.
   1. Polystyrene foam board, 1 inch thick.

C. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene core; polypropylene filter fabric.

D. Cant Strips: Premolded composition material.

E. Termination bars: Stainless steel or Aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Install cant strips at all 90 degree vertical transitions in foundation walls. Membrane to extent minimum 12 inches horizontally on foundation.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.

I. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

A. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.

B. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.

C. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.

D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, and exterior wall behind masonry or siding wall finish.

B. Batt insulation in exterior and interior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Installation schedule: Provide description of locations where each proposed product will be installed. Include description of compliance with fire rated, acoustical and NFPA 285 details.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATION SCHEDULE

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundations, below grade: Extruded polystyrene (XPS) board.

C. Insulation at Perimeter of Foundations, above grade: Mineral Wool Board.

D. Insulation as Protection Board at Foundations, below grade only: Extruded polystyrene (XPS) board.

E. Insulation Inside Cavity of Masonry Veneer Walls, below grade only: Etruded polystyrene (XPS) board.

F. Insulation on Inside Cavity of Masonry Veneer Walls, above grade: Extruded polystyrene (XPS) board.

G. Insulation on exterior face of sheathing: Mineral Wool board.

H. Insulation behind exterior Metal Wall Panels: Mineral Wood board.

I. Insulation inside STC and Fire Rated partitions: SAFB Mineral Wool Insulation, no vapor retarder.

J. Insulation inside exterior metal framing walls: Batt insulation with no vapor retarder

K. Insulation inside metal framed partitions: Batt insulation with no vapor retarder.

L. Insulation inside Wood Framed Walls: Batt insulation with no vapor retarder.

M. Insulation in Framed Ceiling Structure: Batt insulation with separate vapor retarder.

N. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation **(XPS)**: ASTM C578, Type IV; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: 1-1/2 inches, or unless indicated otherwise.
   5. Board Edges: Shiplap.
   6. Thermal Conductivity (k factor) at 25 degrees F: 0.18 (R= 5 minimum per inch).
   7. Compressive Resistance: 25 psi.
   8. Manufacturers:
      a. Dow Chemical Company: www.dow.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Mineral Wool Board Insulation: Rigid or semi-rigid stone wool insulation, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Combustibility: Behavior of material at 750 degrees as non-combustible per ASTM E136.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Board Size: 16 by 48 inches standard, size varies by manufactuer,.
   4. Board Thickness: 2 inches and/or as indicated on drawings.
   5. Thermal Resistance: R-value of 4.3 per inch at 75 degrees F, minimum, when tested according to ASTM C518.
   6. Minimum Density: 4.3 pound per cubic foot, nominal.
   7. Manufacturers:
      a. Johns Manville;CladStone 45: www.jm.com/#sle.
      b. ROCKWOOL (ROXUL, Inc); CAVITYROCK: www.rockwool.com/#sle.
      c. Thermafiber, Inc;RainBarrier ic HC 80: www.thermafiber.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or SAFB mineral wool insulation may be used, at Contractor's option, unless specifically noted or required otherwise.
   1. Use Sound Attenuation Fire Blanket (SAFB) Mineral Wool at all fire rated assemblies and STC rated wall per drawings and partition schedule and as required by code/UL test.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value of 3.5 per inch minimum.
   6. Thickness: Match cavity thickness or as indicated on drawings or insulation schedule.
   7. Facing: Unfaced.
   8. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/#sle.
      b. Johns Manville: www.jm.com/#sle.
      c. Knauf Insulation GmbH: www.knaufinsulation.us.
      d. Owens Corning Corp: www.owenscorning.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

C. Sound Attenuation Fire Blanket (SAFB) Mineral Wool: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Thermal Resistance: R-value of 3.5 per inch, minimum.
   4. Thickness: Match cavity thickness, indicated on drawings or per insulation schedule.
   5. Manufacturers:
      a. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
      b. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Wire Mesh: Galvanized steel, hexagonal wire mesh.

D. Protection Board for Below Grade Insulation: XPS, 2 inch thick.

E. Adhesive: Type recommended by insulation manufacturer for application.

F. Spray-foam Insulation: See slso Section 07 2119.
   1. Polyurethane expanding foam.
   2. Products: DuPont Great Stuff; www.greatstuff.dupont.com
   3. Dupont Great Stuff

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over building expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Mechanically fasten insulation boards to sheathing with rust resistant screws and 2" diameter rigid plastic washers to allow secure attachment.
   1. Install 24 inches each way or as prescribed by insulation manufacturer.

C. Install boards horizontally on walls.
   1. Install in running bond pattern.
   2. Butt edges and ends tightly to adjacent boards and protrusions.

D. Extend boards over expansion joints, unbonded to wall on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation.

3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at following frequency:
   1. Six (6) per insulation board.

B. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Install boards to fit snugly between wall ties.

D. Install boards horizontally on walls.
   1. Install in running bond pattern.
   2. Butt edges and ends tightly to adjacent boards and protrusions.
   3. Place impale fastener locking discs.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

D. Install spray-foam insulation around gaps and voids in penetrations through board insulation.

3.06 BOARD INSTALLATION OVER STEEP SLOPE ROOF SHEATHING OR ROOF STRUCTURE

A. Installation of board insulation over steep slope roof structure or roof sheathing is specified in Section 06 1000.

3.07 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in interior sound attenuated and exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Cut and form insulation as necessary to fully fill all cavities and void spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At attic locations with gyp-bd ceilings, use spray foam around all penetrations through gyp-bd layer. Apply to seal all air leakage around pentrations and to insluate around device. Fill voids around plumbing pipes, conduits, wiring, junction boxes, etc poking though attic ceiling layer.

F. Install insulation in thicknesses required to achieve minimum desired R-values below; unless noted otherwise.
   1. Walls: R-19
   2. Floors: R-13
   3. Floors above unconditioned spaces: R-19
   4. Ceilings at unconditioned attic spaces: R-29

G. Fill voids in walls and cavities around perimeter of openings with spray-foam insulation. Fill shim spaces around window perimeters full with batt insulation or low-expanion spray-foam insulation.

3.08 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Foamed-in-place insulation installed as part of the exterior building thermal envelope.

B. At junctions of dissimilar wall and roof materials.

C. Protective intumescent coating.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements and shop drawings identifying locations being applied.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

D. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Field Density testing: Take field samples daily and provide report on density of samples.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.07 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

MANUFACTURERS

2.01 FOAMED-IN-PLACE INSULATION:

A. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.

B. Icynene-Lapolla; Icynene ProSeal (MD-C-200 v3): www.icynene.com/#sle.

C. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   2. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   3. Water Absorption: Less than 1 percent by volume, maximum, when tested in accordance with ASTM D2842.
   4. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   5. Closed Cell Content: At least 90 percent.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   7. Density: 2.0 lbs/cuft, nominal, in accordance with ASTM D1622/D1622M.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Overcoat: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R-value of 20.

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Trim excess away for applied trim or remove as required for continuous sealant bead.

G. Apply insulation inside of building at all transitions from wall to roof, at underside of all roof ridges, hips and valleys, all penetrations through roofs, and as otherwise indicated at drawings.

H. Apply overcoat to surface at locations where it is not concealed behind 1/2" thick gypsum board. Overcoat to be equivalent to a 15 minute thermal barrier as required by IBC.

3.04 FIELD QUALITY CONTROL

A. Inspection will include verification of insulation and overcoat thickness and density. Installer to take daily tests and maintain a log of tests and areas performed.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Weather Barrier Assemblies: Under exterior wall cladding, integral with sheathing or applied to substrate; that resists the transmission of air and is moisture permeable.

B. Transition Membrane: Membrane products that span joints between different types of substrates to provide continuity

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

D. Flashing: Materials that form a system to move liquid water to the outside of the exterior walls typically occurring at wall transitions and openings.

1.02 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

G. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015, with Editorial Revision (2020).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

1.04 MOCK-UP

A. Install weather barrier materials in mock-up.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:
   1. At concrete walls: On the outside surface of the concrete use air barrier coating.
   2. At Masonry wall construction: On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
   3. At framed walls with Masonry Veneer: Use wall sheathing with integral weather barrier as specified in section 06 1000 Rough Carpentry. Joint and perimeter treatments per 07 2500 Weather Barriers.

4. At mechanically attached siding: Use wall sheathing with integral weather barrier as specified in section 06 1000 Rough Carpentry. Joint and perimeter treatment per 07 2500 Weather Barriers.
5. At framed walls with Metal Wall Panels: Use wall sheathing with integral weather barrier as specified in section 06 1000 Rough Carpentry. Joint and perimeter treatment per 07 2500 Weather Barriers.

B. Vapor Retarder:
1. At underside of slab on grade concrete floors use vapor retarder sheet. Reference specification 03 3000.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier (Weather Barrier) Coating:
1. Material: Water-based acrylic or polymer-modified bitumen.
2. Dry Film Thickness: 20 mils (0.020 inch), minimum. Verify with manufacturer.
3. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
4. Water Vapor Permeance: 12 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
5. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for up to 4 months of weather exposure after application.
6. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
8. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
9. VOC Content: 25 g per L or less.
10. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
11. Manufacturers:
    a. BASF Corporation; ENERSHIELD-HP: www.master-builders-solutions.basf.us/#sle.
    b. Carlisle Coatings and Waterproofing, Inc.; Barritech-VP: www.carlisle-ccw.com.
    c. DuPont Building Innovations; Tyvek Fluid Applied WB, Fluid Applied Flashing - Brush Formulation, Fluid Applied Flashing & Joint Compound, and Sealant for Fluid Applied System: www.dupont.com.
    d. Parex USA, Inc; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/#sle.
    e. PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.
    f. W.R. Meadows, Inc.; Air-Shield LMP: www.wrmeadows.com.
    g. Tremco; ExoAir 230: www.tremcosealants.com.
    h. Substitutions: See Section 01 6000 - Product Requirements.

2.03 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Sheet : See specification section 03 3000.

2.04 SEALANTS

A. Butyl Sealant: as specified in Section 07 9200.

B. Sealants: as specified in Section 07 9200.

C. Polyurethane Sealant: as specified in Section 07 9200.

D. Sealant Backers: As specified in Section 07 9200.

E. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.05 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Thickness: 40 mil, 0.040 inch, nominal.
   2. Manufacturers:
      a. Carlisle Coatings and Waterproofing, Inc.; CCW-705 TFW: www.carlisle-ccw.com.
      b. Intertape Polymer Group, Inc; NovaFlash SA Universal Self-Adhered Flashing (25 mil): www.itape.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Liquid Flashing for sheathing with integral weather barrier: One part, fast curing, non-sag, gun grade, trowelable liquid flashing.
   1. Georgia Pacific LLC; DensDefy Liquid Flashing: www.gpgypsum.com.

D. Transition Membrane for sheathing with integral weather barrier: Self-adhering flexible membrane:
   1. Georgia Pacific LLC; DensDefy Transition Membrane: www.gpgypsum.com.

E. Thinners and Cleaners: As recommended by material manufacturer.

F. Dust resistant cap screws, length as necessary to penetrate sheathing with plastic screw caps that seal penetration air tight.
   1. Tyvek Wrap cap screws, by DuPont, with 2 inch diameter caps.
   2. Approved equal.

G. Seam Tape: Dupont Tyvek Tape as distributed by DuPont.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions. Coordinate installation with products installed in openings and penetrations.

B. Air Barriers & Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Fluid Coatings (Spray or Roll Applied):
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal air tight with sealant.
   4. Use flashing to seal to adjacent construction and to bridge joints.

D. Openings and Penetrations in Exterior Weather Barriers (including sheathing with integral weather barrier):
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange. Install weather barrier into opening

beyond the inside face of opening frame. Coordinate depth with opening unit.

3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between opening unit frame and rough framing, flashing around opening perimeter using joint sealant over backer rod and sealed directly to the weather barrier.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

B. Do not cover installed weather barriers until required inspections have been completed.

C. Take digital photographs of each portion of the installation prior to covering up.
   1. Photograph each penetration through weather barrier prior to concealing from view.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4213.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Exterior curtain wall system consisting of formed metal composite material (MCM) sheet, framing, secondary supports, and anchors to structure.

B. Matching flashing and trim.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2023.

E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023b.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

H. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

J. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

M. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

N. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.

O. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet; 2010 (Reapproved 2022).

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

Q. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

R. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

S. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

T. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
   1. Require attendance by the installer and relevant sub-contractors.
   2. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
   3. Review procedures for protection of work and other construction.
   4. Review safety precautions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.
   4. Specimen warranty for wall system, as specified herein.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the wall system must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
   6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Selection Samples: For each finish product specified, submit at least three sample color chips representing manufacturer's standard range of available colors and patterns.

E. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record. Include additional review comments on project specific details where installation may be different than tested wall assembly system.

F. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

G. Test Report: Submit report of full-size mock-up test for NFPA 285 fire performance.

H. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.

I. Installer's Qualification Statement.

J. Testing Agency's Qualification Statement.

K. Maintenance Data: Care of finishes and warranty requirements.

L. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Wall System Manufacturer Qualifications: Company specializing in manufacturing wall panel systems specified in this section.
   1. With not less than 20 years of documented experience.
   2. Approved by MCM sheet manufacturer.
   3. Submit contact names and phone numbers for at least three references connected with successful past projects.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. With minimum five years of documented experience.
   2. Approved by wall panel system manufacturer.
   3. Submit contact names and phone numbers for at least three references connected with successful past projects.

D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

E. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
   1. Locate where directed.
   2. Provide panels finished as specified.
   3. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of any accumulated water.
   4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. MCM Sheet Manufacturer’s Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
   1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
   2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

C. Installation Warranty for Dry Seal (Caulked) Assembly: Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

D. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including attachments, framing, and exterior panels) to provide 10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Panel System Manufacturers:
   1. Petersen Aluminum Corporation; PAC-3000 CS: www.pac-clad.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALL PANEL SYSTEM

A. MCM-1 Wall Panel System: PAC-3000 CS Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
   1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
   2. Provide panel jointing and weatherseal using reveal joints and gaskets but no sealant.
   3. Anchor panels to supporting framing without exposed fasteners.

2.03 PERFORMANCE REQUIREMENTS

A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

B. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
   1. Inward Design Wind Pressure: 26 psf.
   2. Outward Design Wind Pressure: 30 psf.
   3. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
   4. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.

C. Air Infiltration: 0.06 cfm/sq ft of wall area, maximum, when tested at 1.57 psf in accordance with ASTM E283.

D. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
   1. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
   2. Design to drain leakage and condensation to the exterior face of the wall.

E. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing performed for previous project is acceptable provided tested system was truly equivalent.

F. Panels: One inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
   1. Reinforce corners with riveted aluminum angles.
   2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
   3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing

local stresses or read-through on panel face.

4. Reinforce panels over 60 inches long with metal angle braces 24 inches on center in short direction minimum, or as directed by MCM manufacturer.
5. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
6. Metallic Finished Panels: Maintain consistent grain of MCM sheet; specifically, do not rotate sheet purely to avoid waste.
7. Fabricate panels under controlled shop conditions.
8. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
9. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
    a. Make panel lines, breaks, curves and angles sharp and true.
    b. Keep plane surfaces free from warp or buckle.
    c. Keep panel surfaces free of scratches or marks caused during fabrication.
10. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
11. For "dry" jointing, secure extrusions to returned pan edges with stainless steel rivets; provide means of concealed drainage with baffles and weeps for water that might accumulate in members of system.

2.04 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of mineral filled fire-resistant polymer material; no foamed insulation material content.
    1. Overall Sheet Thickness: 0.118 inch, minimum (3mm)
    2. Face Sheet Thickness: 0.019 inches, minimum.
    3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
    4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
    5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.

B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
    1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
    2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
    3. Stainless Steel Sheet Components: ASTM A480/A480M.
    4. Aluminum Components: ASTM B209 (ASTM B209M); or ASTM B221 (ASTM B221M).

2.05 FINISHES

A. Factory Finish: Two coat fluoropolymer resin coating (including Mica finishes), approved by coating manufacturer for length of warranty specified for project, and applied by coil manufacturing facility that specializes in coil applied finishes.
    1. Coating Flexibility: Pass ASTM D4145 minimum 1T Bend, at time of manufacturing.
    2. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.

B. Color/Texture: As selected by Architect from manufacturer's standard range, including mica finishes.

2.06 ACCESSORIES

A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; refer to Section 07 6200 for additional requirements.

B. Anchors, Clips and Accessories: Use one of the following:
   1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
   2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
   3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 10.

C. Fasteners:
   1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
   2. Screws concealed within assembly: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
   3. Bolts: Stainless steel.
   4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

D. Joint Sealer: As specified in Section 07 9005, subject to MCM sheet manufacturer's approval.

E. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

B. Provide anchorage items to be cast into concrete or built into masonry to appropriate installer(s) together with setting templates.

3.03 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Fabricate and form panels with hairline joints and crisp edges.

C. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

D. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners. Attach wall system supports to structure as not to disrupt or compromise the weather barrier system. Repair and/or patch any damage caused to weather barrier system due to installation of wall panel attachments.

E. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

F. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

G. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

H. Where joints are designed for field applied sealant, seal joints completely with specified sealant. In addition to rainscreen extrusions, at joints exposed vertically, install sealant to protect from water intrusion.

I. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

J. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

K. Inspect all panels for installed weep locations to ensure proper drainage of any accumulated water or moisture behind panel system. At soffit panel locations, install weeps to permit drainage.

L. Replace damaged products.

3.04 FIELD QUALITY CONTROL

A. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

3.05 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Single ply thermoplastic roofing membrane fully adhered system.

B. Insulation, flat and tapered.

C. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

E. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

F. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).

G. FM (AG) - FM Approval Guide; Current Edition.

H. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2022).

I. NRCA (RM) - The NRCA Roofing Manual; 2023.

J. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog data for membrane materials including flashing materials, insulation, fasteners, and adhesives.
   1. LEED Submittals: Include testing documentation for solar reflectance index.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, mechanical fastener layout, and paver layout.
   1. Include UL Assembly and FM Assembly Compliance.

D. Wind resistance documentation including uplift wind pressures, calculations, assembly installation methods and manufacturer's certification on uplift pressures.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's Qualification Statement.

G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions.

H. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

I. Manufacturer's Qualification Statement.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer. Provide letter from manufacturer indicating intent to warrant the roofing system.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty:
   1. Material Warranty: Provide single-source manufacturer's No Dollar Limit (NDL) warranty for weathertightness of roofing system, include agreement to repair and/or replace roofing that fails to keep out water within specified warranty period of 20 years from date of Substantial Completion.
   2. Warranty coverage to include roofing membrane, base flashings, liquid applied flashing, roofing membrane accessories, roof insulation, fasteners, cover board, walkway products, manufacturer's expansion joints, edge metal products, parapet caps, and other single-source components of roofing system marketed by the manufacturer.

C. Installer's Warranty: Provide warranty in which installer agrees to repair and replace components of the roofing system that fail in materials or workmanship within 2 years from the date of Substantial Completion.
   1. Warranty coverage to include work of the Section, including all components of roofing system such as membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders and walkway products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Materials:
   1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlislesyntec.com.
   2. Firestone Building Products, LLC: www.firestonebpco.com/#sle.
   3. Johns Manville CorporationJM TPO: www.jm.com..
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Atlas Roofing Corporation: www.atlasroofing.com.
   2. Carlisle SynTec; SecurShield Insulation: www.carlisle-syntec.com/#sle.
   3. GAF: www.gaf.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING SYSTEM DESCRIPTION

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing System Requirements:
   1. Warranty: Full system warranty covering membrane, roof insulation, and membrane accessories.
   2. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
      a. Field applied coating may not be used to achieve specified SRI.
   3. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
   4. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
   5. Wind resistance: Roofing system must be successfully tested by a qualified testing agency following ANSI/FM 4474 to resist the design uplift pressures calculated by the American Society of Civil Engineers (ASCE) 7 and after multiplying the results with a safety factor (determined by design professional), but assembly uplift pressures shall be not less than 60 lbs. / sq. ft.
   6. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required to achieve total LTTR of 26.

C. Roofing System Components: Listed in order from the top of the roof down:
   1. Membrane: Thicknesses as specified, fully adhered.
   2. Coverboard Over Insulation: Mechanically attached.
   3. Insulation: Mechanically attached.
   4. Structural base.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
      a. Thickness: 60 mil, 0.060 inch, minimum.

B. Flexible Flashing Material: Same material as membrane.

C. Water Pervious Fabric: Woven polyethylene, UV stabilized, open to moisture movement, black.

2.04 DECK SHEATHING & COVERBOARD

A. Deck Sheathing & Coverboard : Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 5/8 inch, Type X, fire resistant.
   2. Manufacturers:
      a. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com/#sle.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
   2. Board Size: 48 by 96 inch.
   3. Board Thickness: 2.0 inch. minimum. Provide insulation in layers as necessary to achieve LTTR, minimum 2 layers of insulation.
   4. Tapered Board: Slope as indicated; minimum thickness 0.5 inch; fabricate of fewest layers possible.

2.06 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Sheet Metal Flashings: See Section 07 6200.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

D. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

E. Insulation Adhesive: As recommended by insulation manufacturer.

F. Sealants: As recommended by membrane manufacturer.

G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Size: 18 by 18 inch.
   3. Surface Color: White or yellow.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

G. Install blocking at all locations where fastening occurs where structure is not locationed. Blocking required but not limited at parapets, termination bars, and as shown on drawings.

3.03 INSULATION APPLICATION - UNDER MEMBRANE

A. Attachment of Insulation:
   1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

B. Cover Boards: Fully adhere cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

G. Install tapered insulation at roof drain counterslope to be twice the main roof slope.

H. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls. Adhesive amount must conform to FM Assembly requirements.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto all vertical surfaces.
   2. At parapet and roof edge locations, extend membrane system up vertical surface, under parapet cap to outside edge of parapet.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings.

I. Seal perimeter of entire roofing system membrane to weather barrier.

3.05 FINISHING UNBALLASTED SURFACES

A. Install walkway pads. Space pad joints to permit drainage.

B. Place walkway pads around perimeter of all rooftop mounted equipment, roof hatches, ladders, roof access doors and/or as indicated on drawings. Provide paths from roof access locations to all rooftop equipment.

3.06 FIELD QUALITY CONTROL

A. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.07 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations. Daily remove any object(s) that may cause damage to roofing system.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

C. Sheet metal splash pans.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).

F. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

H. CDA A4050 - Copper in Architecture - Handbook; current edition.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, material thickness, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit one sample, 12 x 12 inch minimum in size illustrating material and fabrication details of typical standing seam profiles.

D. Samples: Submit two samples _2_by_3___ inch in size illustrating metal finish color.
   1. Color chart can be submitted preliminary as long as a physical sample is submitted for final approval

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 3 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Reference roofing specifications for warranty limits and terms that apply. Products or fabrications installed with the roofing system to contain manufacturer's warranty as specified in roofing specification section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   2. Metal Era Inc. www.metalera.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick minimum; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.

2.03 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Form sections true to shape, accurate in size, square, and free from distortion or defects. Fabricate metal flashing and trim without excessive oil canning, buckling and tool marks, true to line and levels indicated with exposed edges folded back to form hems.

D. Form pieces in longest possible lengths to a maximum of 15 feet unless specifically approved otherwise by Architect. Treat seams between two different pieces with flat-lock seams at non-moving joints, unless otherwise indicated. At moving seams, use seated, lapped, bayonet type or interlocking hooked seams.

E. All exposed edges to be folded back with hem of 1/2 inch; miter and seam corners.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

H. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joint of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints. Provide for expansion no more than in 40 feet long sections.

I. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

J. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
   1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than the thickness of the metal being secured.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA Architectural Sheet Metal Manual, Square profile - 6".
   1. Lengths to be continuous no longer than 40 foot sections.
   2. Joints to be flat-lock seam with sealant.

3. Corners to be factory mitered and welded.
4. Expansion joints to have end of each gutter capped, allow for 1" of expansion between gutters and covered with coverplate.

B. Downspouts: Rectangular profile 4" wide x 3" deep or unless indicated otherwise.
1. Same as Gutters except: Vertical seams to be Double Corner Seam with sealant.

C. Accessories: Profiled to suit gutters and downspouts.
1. Anchorage Devices: In accordance with SMACNA requirements with Stainless Steel or Aluminum fasteners.
2. Gutter Supports: Straps of size per SMACNA requirements, but not less than twice the thickness of the gutter material.
3. Downspout Supports: Straps.
4. Valley Diverters: 12-inch x 12-inch minimum at valley, 0.040 inch thick minimum. Extend a minimum of 4" above eave edge.

D. Splash Pans: Same metal type as downspouts, formed to 8 by 12 inch size; rolled sides of 3 inch high for inverted pan placement.

E. Seal metal joints, see Joint Sealants.

2.05 ACCESSORIES

A. Fasteners: Aluminum or Stainless Steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.

E. Flexible Flashing: Self-adhered flashing as specified in Section 07 2500.

F. Sealants: Type as specified in Section 07 9200.

G. Plastic Cement: ASTM D4586/D4586M, Type I.

2.06 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Manufactured Straight and Radius Copings: See Section 07 7100.

B. Manufactured Roof Edge / Gravel Stop Edge: See Section 07 7100.

C. Accessories:
1. Splice Plates: Same thickness as coping, minimum.
2. Cleats: Same thickness as coping, minimum.

2.07 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Constructions: Fabricate head, sill and similar flashing to extend beyond openings as indicated. Unless otherwise indicated, form head and sill flashing with 2-inch high end dams.

2.08 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Beam and Column Surrounds: Fabricate as detailed, reinforced as required for a smooth, even appearance without oil-canning or distortions, with tight seams and all exposed edges hemmed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION GENERAL

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted. Install system to comply with FMG or ES-1 system ratings.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Secure gutters and downspouts in place with concealed fasteners. Pop-rivets are not concealed Fasteners.

E. Set splash pans under downspouts. Coordinate attachment with roofing system.

F. Finishes: Touchup all scratches to painted finish in field with paint to match.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 24 inches apart. Provide enclosures and seal watertight with sealant. Slope gutters 1/4 inch per 10 feet minimum to downspouts.
   1. Fasten gutter spacers to front and back of gutter.
   2. Loosely lock straps to front gutter bead and anchor to roof deck.
   3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   4. Anchor back of gutter that extends onto roof deck with cleats spaces not more than 24 inches apart.
   5. Install gutter with expansion joints at locations indicated or not exceeding 40 feet apart.

C. Downspouts: Join sections with 1-1/2" telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
   2. Secure downspouts to building with straps and mechanical fasteners. Do not use pop-rivets.
   3. Provide elbows at base of downspout to direct water away from building.

D. Collection Boxes: Anchor securely to wall.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, an level as indicated. Install work with laps, joints ans seams that will be permanently watertight.

B. Roof Edge Flashing and Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Comply with installation requirements of roofing manufacturer regarding spacing of anchors below membrane flashing in field of roof.
   1. Install flexible flashing covering entire substrate beneath coping; not required where roofing material extends beneath coping. Seal perimeters against weather barrier and/or roofing.
   2. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at minimum 8-inch centers.

C. Pipe or Post Counterflashing: Install counter flashing umbrella with close -fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches of base of flashing.

Install stainless steel draw band and tighten.

D. Counterflashing: Coordinate installation of counter flashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
   1. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetration moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill and similar flashings to extend beyond wall openings a minimum of 4 inches or as indicated.

C. Install reglets per manufacturer's recommendations.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7100
ROOF SPECIALTIES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Factory manufactured roof specialties, including straight and radius copings copings, fascias, gravel stops, vents, and roof edges.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

D. NRCA (RM) - The NRCA Roofing Manual; 2023.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty:
   1. Material Warranty: Provide warranty to repair and/or replace components that fails to keep out water within specified warranty period of 20 years from date of Substantial Completion. Warranty must be compatible with overall roofing system manufacturer.
   2. Performance Warranty: Provide warranty to repair and/or replace components that fails to withstand 120 mph wind speeds for specified warranty period of 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Straight Copings and Roof Edges:
   1. Architectural Products Co: www.archprod.com/#sle.
   2. Metal-Era Inc: www.metalera.com/#sle.
   3. Peterson Aluminum Corp; www.pac-clad.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Radius Copings:
   1. Metal Era Inc: www.metalera.com.
   2. Peterson Aluminum Corp; www.pac-clad.com
   3. Substitutions: See Section 01 6000- Product Requirements.

C. Pipe and Penetration Flashings:
   1. Portals Plus: www.portalsplus.com/#sle.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
   4. Finish: 70 percent polyvinylidene fluoride.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Manufacturers:
      a. Basis of Design: Peterson Aluminum Corp; Pac-Loc Fascia 2000: www.pac-clad.com

B. Straight Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners, .
   1. Configuration: Concealed 20 ga. hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners. Cleat to be nominal 1'-0" in width and located at approximately 4'-0" o.c.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
      PICK THICKNESS OF ALUMINUM, REFER TO SMACNA FOR GUIDELINES.
   3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
   4. Finish: 70 percent polyvinylidene fluoride.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Manufacturers:
      a. Basis of Design: Peterson Aluminum Corp; Pac-Tite: www.pac-clad.com

C. Radius Copings: Fabricate to sizes required; welded corners; concealed fasteners.
   1. Configuration: Concealed 20ga hold down cleat at both legs; internal splice piece at joints of same material thickness as cap; concealed stainless steel fasteners. Cleat to be 1'-0" in width and located at approximately 4'-0" o.c.
   2. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
   3. Finish: 70 percent polyvinylidene fluoride.
   4. Color: To be selected by Architect from manufacturers standard range.
   5. Factory fabricate radiused copings to provide seamless, non-segmented curve, with welded or non-penetrating fastened seams.
   6. Fabricate in sections no smaller than 4-foot and no larger than 10-foot.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer. Type as specified in Section 07 9200.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Roof Cement: ASTM D4586/D4586M, Type II.

D. Flexible Flashing: See Section 07 2500.

E. Fasteners: Stainless steel screw type with a minimum pull-out resistance of 240 # (109 kg) as supplied by the manufacturer per substrate application. No exposed fasteners shall be

permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Conform to SMACNA Architectural Sheet Metal Manual (ASMM) drawing details.

C. Roof Edge, Specialty Coping and Radius Copings: Anchor to resist uplift and outlet forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Comply with installation requirements of roofing manufacturer regarding spacing of anchors below membrane flashing in field of roof.

1. Install flexible flashing covering entire substrate beneath coping; not required where roofing membrane extends beneath coping. Seal perimeters against weather barrier and/or roofing.
2. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at minimum 8 inch centers.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. FM (AG) - FM Approval Guide; Current Edition.

C. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, locations of all rated walls with type of fire stopping system proposed, fire rating of the penetrated assembly, locations of all rated walls with type of fire stopping system proposed, firestopping test or design number, and locations of all rated walls with type of fire stopping system proposed.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Certificate from authority having jurisdiction indicating approval of materials used.

F. Installer Qualification: Submit qualification statements for installing mechanics.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.

1.05 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.

B. If accepted, mock-up may remain and represent minimum standard of the Work. Remove and replace mock-ups not accepted.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Prohibited Materials: Do not use any product that contains asbestos..

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Caulk or putty.

C. Firestopping at Combustible Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.

D. Firestopping at Cable Tray Penetrations: Any material meeting requirements.

E. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Any material meeting requirements.

F. Firestopping at Control Joints (without Penetrations): Any material meeting requirements.

G. Firestopping Between Edge of Floor Slab and Curtain Wall: Fiber firestopping with smoke seal coating.

H. Firestopping Between Top of Partition Wall and Roof Slab: Fiber firestopping with smoke seal coating.

I. Temporary Firestopping: Reusable intumescent shapes.

2.03 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
   1. Color: Dark Grey or Red
   2. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.

C. Foam Firestoppping: Single component silicone foam compound.
   1. Color: Dark Grey or Red.
   2. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti, Inc: www.us.hilti.com.
      c. Specified Technologies, Inc: www.stifirestop.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers.
   1. Color: Dark Grey.
   2. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. USG: www.usg.com.

E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening.
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. Pecora Corporation: www.pecora.com.
      c. Thermafiber, Inc: www.thermafiber.com.

F. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

G. Firestop Devices - Cast-In Type: Sleeve and sealing material, intended to be cast in concrete floor forms or in concrete on metal deck, not requiring any additional materials to achieve penetration seal.
   1. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti, Inc: www.us.hilti.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

H. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 1000 percent.
   2. Color: Red.
   3. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

I. Reusable Firestopping: Removable intumescent compressible shapes, pillows, or blocks specifically tested in removable configuration.
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. Hilti, Inc: www.us.hilti.com.
      c. Nelson FireStop Products: www.nelsonfirestop.com.
      d. Specified Technologies, Inc: www.stifirestop.com.

J. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Sample product warranty.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.04 MOCK UP

A. Provide mock-up of sealant joints in conjunction with wall and air barrier system.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed. Mockup may remain as part of the Work.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
      a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.
      b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
   3. Field testing agency's qualifications.

E. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   3. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   4. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   5. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

F. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
   3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
   3. Pecora Corporation: www.pecora.com.

4. Sherwin-Williams Company: www.sherwin-williams.com.
5. Sika Corporation: www.usa-sika.com.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
2. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
3. Pecora Corporation: www.pecora.com.
4. Sherwin-Williams Company: www.sherwin-williams.com.
5. Sika Corporation: www.usa-sika.com.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.
c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
a. Joints between door, window, and other frames and adjacent construction.
b. Other joints indicated below.
3. Do not seal the following types of joints.
a. Intentional weepholes in masonry.
b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing; Type H.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing; Type H.
3. Butt Joints in Exterior Metal Work and Siding: Acrylic Emulsion; Type G.
4. Joints between concrete panels and between panels of adjacent work:
5. Joints between masonry and cast stone: Type U with sand.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
4. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.03 NONSAG JOINT SEALANTS

A. Type U-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Cure Type: Single-component, neutral moisture curing.
   6. Service Temperature Range: Minus 20 to 180 degrees F.
   7. Manufacturers:
      a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
      b. Pecora Corporation: www.pecora.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Type U-2 - Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.
   4. Cure Type: Single-component, neutral moisture curing
   5. Service Temperature Range: Minus 65 to 180 degrees F.
   6. Manufacturers:
      a. Dow Chemical Company; DOWSIL 999-A Building and Glazing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
      b. Pecora Corporation: www.pecora.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Type E - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Manufacturers:
      a. Pecora Corporation: www.pecora.com.

D. Type A - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:
      a. Pecora Corporation: www.pecora.com.
      b. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.
      c. BASF Corporation; MasterSeal NP1, One component polyurethane sealant. www.master-builders-solutions.basf.us
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Type J - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:

a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

F. Type B - Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.

G. Type G - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Manufacturers:
a. Pecora Corporation: www.pecora.com.
b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.

H. Type C - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Service Temperature Range: Minus 13 to 180 degrees F.
4. Manufacturers:
a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

I. Type H - Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.
1. Manufacturers:
a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.

2.04 SELF-LEVELING SEALANTS

A. Type F - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Grey.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
a. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
b. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.

B. Type P - Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic. Joint filler for areas to receive polished concrete finish. Confirm material with system manufacturer / installer.
1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
2. Color: To be selected by Architect from manufacturer's standard colors.

3. Joint Width, Maximum: 3/4 inch.
4. Manufacturers:
   a. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: www.ardexamericas.com/#sle.
   b. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
   c. Nox-Crete Inc; DynaFlex JF-85: www.nox-crete.com/#sle.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Open Cell: 40 to 50 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

F. Sand: White or tan sand, selection based on field mockup.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

D. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Sound-rated hollow metal doors and frames.

F. Hollow metal borrowed lites glazing frames.

G. Accessories, including glazing, louvers, and matching panels.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

I. ASTM E413 - Classification for Rating Sound Insulation; 2022.

J. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

L. ITS (DIR) - Directory of Listed Products; Current Edition.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

R. UL (DIR) - Online Certifications Directory; Current Edition.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

E. Manufacturer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Assa Abloy Ceco, Curries or Flemming; www.assaabloydss.com
   3. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled, both sides.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum, not less than level specified.
   2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
   3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane. U-Value of 0.50 minimum.
   4. Door Thickness: 1-3/4 inch, nominal.
   5. Weatherstripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum, not less than level specified.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.

C. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum, not less than level specified.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.
   3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
   4. Door Thickness: 1-3/4 inch, nominal.

D. Sound-Rated Interior Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum, not less than level specified.
   2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 39, minimum, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
   3. Door Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
   4. Door Thickness: As required to meet acoustic requirements indicated.

5. Sound Seals: Refer to Section 08 7100.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Fully welded.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   3. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

E. Door Frames, Fire-Rated: Fully welded type.
   1. Fire Rating: Same as door, labeled.

F. Sound-Rated Door Frames: Fully welded type.

G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

J. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

K. Frame width to extend past face of wall or partition on either sides, unless noted or detailed otherwise.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 08 8000.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7100.
   1. Exterior Doors: Steel, Z-shaped.
   2. Fire-Rated Doors: Steel, shape as required for fire rating.

D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 7100.

F. Comply with glazing installation requirements of Section 08 8000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1433
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; non-fire rated.

B. Panels of wood and glass.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry: Wood door frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required , special beveling , special blocking for hardware , factory machining criteria , factory finishing criteria .

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Warranty, executed in Owner's name.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Eggers Industries: www.eggersindustries.com/#sle.
   2. Maiman Company: www.maiman.com/#sle.
   3. Marshfield DoorSystems, Inc: www.marshfielddoors.com/#sle.

2.02 DOORS

A. Quality Standard: Premium Grade, Standard Duty performance unless otherwise indicated.

B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints; water repellent treated. Transparent finish as indicated on drawings.

C. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.

2.03 DOOR CONSTRUCTION

A. Fit door edge trim to edge of stiles after applying veneer facing.

B. Bond edge banding to cores.

C. At exterior doors, provide aluminum flashing at the top and bottom rail for full thickness and width of door.

D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

2.04 FACTORY FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Plain Sawn, Red Oak.
   2. Transparent:
      a. Stain: As selected by Architect.

B. Factory finish doors in accordance with approved sample.

2.05 ACCESSORIES

A. Panel or Glass Retention Molding: Wood of same species as door facing, flat bead stop, with mitered corners; prepared for countersink style screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standards.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Adjust width of non-rated doors by cutting equally on both jamb edges.

D. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

E. Machine cut for hardware.

F. Coordinate installation of doors with installation of frames and hardware.

G. Coordinate installation of glazing.

3.03 TOLERANCES

A. Conform to specified quality standard for fit, clearance, and joinery tolerances.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 1713
INTEGRATED METAL DOOR OPENING ASSEMBLIES

PART 1 GENERAL

1.01 GENERAL NOTE

A. The General Conditions, Supplementary General Conditions, and Division 1 - General Requirements are hereby made a part of this Section as fully as if repeated herein.

1.02 SUMMARY

A. Section Includes
   1. Integrated metal door opening assemblies with doors, operating hardware, accessories, and installation for a complete assembly.

1.03 RELATED SECTIONS

A. Section 01 33 00, Submittal Procedures.

B. Section 01 25 13, Product Substitution Procedures.

1.04 REFERENCES

A. ANSI/BHMA A156.32 – Integrated Door Opening Assemblies, 2015.

B. ANSI/UL 10C -- Positive Pressure Fire Tests of Door Assemblies, American National Standards Institute/Underwriters Laboratories, 2001.

C. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, American Society of Testing and Materials; 2004a.

D. NFPA 101 – Life Safety Code, National Fire Protection Association, 2003.

E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies, National Fire Protection Association, 2003.

F. SDI 111 A - Recommended Steel Door Frame Details, Steel Door Institute; 2002.

G. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames, Steel Door Institute, 1997.

H. UL 1784 – Air Leakage Tests for Door Assemblies without an artificial bottom seal, Underwriters Laboratories Inc., 2001 (For Smoke Containment, Enclosed Elevator Lobbies, Fire Service Access Elevator Lobby Doors, Hoistway Opening Protection)

1.05 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Certified to BHMA – A156.32, Integrated Door Opening Assemblies, 2015.

1.06 SUBMITTALS

A. Shop Drawings
   1. In accordance with Section 01 33 00.
   2. Indicate each door and frame condition; frame type, profile and installation detail; items of finish hardware, finishes and electrical rough-in requirements.

B. Samples
   1. In accordance with Section 01 33 00.

C. Environmental
   1. Submit UL certification for Environmental Product Declaration (EPD).

D. Performance
   1. Submit certification for ANSI/BHMA 156.32

E. Fire Certificate of Compliance

1.07 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer: Firm with not less than 5 years successful experience in fabrication of integrated metal door opening assemblies with full-height latch/lock and full-height hinge.
   2. Supplier: Authorized distributor of manufacturer.
   3. Installer: Manufacturer trained.

B. Regulatory Requirements
   1. Rated door assemblies shall have been tested to meet conditions of NFPA 252 as required by NFPA 101 section 6-2.3.3.

1.08 DELIVERY, STORAGE AND HANDLING

A. Packaging: Polyvinyl wrapped, palette by floor, and clearly marked for each opening.

B. Delivery: Deliver to site in original unopened containers and pallets bearing system manufacturers name, and brand.

C. Store: Horizontally on level surface, not less than 2 inches off floor in a clean, dry well-ventilated area protected from sunlight, extreme heat, dryness and moisture.

D. Receiving, off-loading, and site distribution should be handled by an authorized Total Door Distributor unless otherwise stipulated by contract. If the G.C. or other entity handles all or any portion of the receiving, off-loading, and site distribution, they are held responsible for any and all damages that may result from potential miss handling of the product.

1.09 PROJECT CONDITIONS

A. Do not bring door systems to site until building temperature and humidity ranges are compatible with recommended values for preservation of wood moisture content as listed by AWI AWQS. Building shall be stabilized at 30 to 60 percent humidity.

1.10 WARRANTY

A. Integrated metal door opening assembly: Manufacturer's standard 5 year warranty against defects in material and workmanship. Refer to Manufacturer's published warranty.

B. Store doors in a clear, dry ventilated space having controlled temperature and a relative humidity range between 30 and 60 percent. Stack doors flat and off the floor to prevent warpage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Integrated metal door systems
   1. Total Door: www.totaldoor.com.
   2. Substitutions: Refer to Section 01 25 13

B. Hardware
   1. Total Door: www.totaldoor.com.
   2. Substitutions: Refer to Section 01 25 13

2.02 MATERIALS

A. Frames
   1. To be supplied by others.
   2. In accordance with ANSI/SDI A250.8, SDI 111A, and SDI 112.
   3. Construction: KD or All-welded units.
   4. Material: Steel, cold rolled, ASTM A1008, 16 gauge.
   5. Fire Resistance Rating: Where indicated in Contract Documents for doors.
   6. Spreader Bar: Removable, at sill (For all welded type).

B. Frame Anchorage Devices
   1. To securely fasten to wall construction without distortion or stress.
   2. In accordance with fire resistance rating indicated in Contract Documents.

C. Integrated Door Assembly
   1. Integrated Door Assembly
      a. Stiles: Steel, galvannealed, 16-gauge, spot welded.
      b. Top and Bottom Rails: 5-1/2 inch 18 gauge steel rails.
      c. Cores:
         1) Solid polystyrene continuously bonded to faces.
         2) Temperature Rise.
      d. Thickness: 1-3/4 inches.
      e. Faces: Steel, stretcher leveled, without seams or spot welds, galvannealed 20 gauge.
      f. Weld pattern: In accordance with manufactures standard details.
   2. Gasketing
      a. Door System: Factory applied to locking channel
      b. Frame: Factory supplied, field apply to head of frame.
      c. Floor: Factory supplied Surface Smoke Seal to be field applied. (must be ordered with elevator shaft & lobby applications)
         1) FINISHES

D. Hinge and Locking Channel
   1. Finish: Factory Pre-Finished.
      a. Custom color to be selected by Architect.

E. Door Faces, Interior
   1. Finish: Custom color to be selected by Architect, refer to door schedule.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field Conditions
   1. Prior to commencing installation, examine parts of building structure, which are to receive door systems and component parts.
   2. Report, in writing, conditions which would prevent proper execution or endanger permanency of the work to the Architect.

B. Field Dimensions
   1. Where possible, verify frame tolerances before fabrication of door systems.
   2. Notify Architect of variances with reviewed shop drawings.

C. Corrective measures, when necessary, shall be determined and approved prior to commencing fabrication.

D. Coordinate door opening assembly details with adjacent work to assure proper attachments, clean junctions, etc.

3.02 INSTALLATION

A. Install work in accordance with Contract Documents and reviewed shop drawings.
   1. Install door systems and hardware in accordance with manufacturer's recommendations.
   2. Installer: Manufacturer trained.

B. Frames: Installed by others
   1. Set plumb and square in accordance with DHI standards.
      a. Out-of-square at frame head: Not to exceed 1/16 inch.
      b. Out-of-plumb for each frame jamb: Not to exceed 1/16 inch.
      c. Out-of-alignment for each side in plan: Not to exceed 1/16 inch.
      d. Twist dimension: Not to exceed 1/16 inch.
   2. Brace until adjacent wall is constructed.
   3. Securely anchor to adjacent wall.
   4. Furnish and install clips, fastenings, and anchorages and conceal unless otherwise noted.

C. Integrated Door Assembly
   1. Hang to maintain manufacturer's installation tolerances.
   2. Adjust to freely swing without binding, sticking, or sagging, and to eliminate excessive clearances.

D. Hardware: When installation is otherwise complete, confirm proper operation and function.

PART 4 SYSTEM SCHEDULE

4.01 90° HOLD OPEN

A. Full Height Hinges H-13 Rigidized Color TBD Total Door

B. Full Height Latch Channel L-11 Color TBD Total Door

C. Operating Pulls M32 628 Total Door

D. Exit Device/insert to match skin PF200 (Flush Panic) 628 Total Door

E. Closer TDC96P-2 Alum Total Door

F. Mag Holder TDH100 Total Door

G. Positive Pressure label (confirm rating with door schedule) Total Door

H. (Stairwells may require a temperature rise rating)

I. (Elevator lobby doors will require a smoke seal (W60) certified to UL1784 w/out an artificial bottom seal)

4.02 90/180° HOLD OPEN

A. Full Height Hinges H-13 Rigidized (1) Color TBD Total Door

B. Full Height Latch Channel L-11 Color TBD Total Door

C. Operating Pulls M32 628 Total Door

D. Exit Device/insert to match skin PF200 (Flush Panic) 628 Total Door

E. Closer TDC96P-2 Alum Total Door

F. Closer TDC8907 Alum Total Door

G. Mag Holder TDH100 Total Door

H. Positive Pressure label (confirm rating with door schedule) Total Door

I. (Stairwells may require a temperature rise rating)

J. (Elevator lobby doors will require a smoke seal (W60) certified to UL1784 w/out an artificial bottom seal)

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Wall mounted access units.

B. Ceiling mounted access units.

1.02 RELATED REQUIREMENTS

A. See Fire Protection, Plumbing, Mechanical, Electrical, and other associated trades for components located above hard lid ceilings and within walls that may require access panels to reach them. Locations may not be visually shown on drawings but where device is installed and concealed an access panels must be provided. It is encouraged to locate device, valve, etc. in location accessible to avoid installation of access panel. GC responsible to coordinate panel locations among trades to reduce quantity and verify acceptiblity with Architect.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Panel Material: Aluminum extrusions with gypsum board inlay.
   2. Size: 12 inch by 12 inch, minimum or as required to permit access. Coordinate size with other trades access panel is used for.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size: 12 inch by 12 inch., minimum or as required to permit access. Coordinate size with other trades access panel is used for.

C. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel.
   3. Size: 12 inch by 12 inch., minimum, or as required to permit access. Coordinate size with other trades access panel is used for.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
   2. Cendrex, Inc: www.cendrex.com/#sle.
   3. J.L. Industries Inc: www.activarcpg.com/jl-industries
   4. Milcor, Inc: www.milcorinc.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Door Style: Single thickness with rolled or turned in edges.
   2. Frames: 16 gage, 0.0598 inch, minimum thickness.
   3. Single Steel Sheet Door Panels: 1/16 inch, minimum thickness.
   4. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
      a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
      b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
   5. Steel Finish: Primed.
   6. Primed and Factory Finish: Polyester powder coat; color manufacturer's standard.
   7. Hardware:
      a. Hardware for Fire-Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

2.03 WALL MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Drawings do not show all access panels and Contractor is responsible to provide all access panels as required for a complete installation.

C. Coordinate installation locations with other trades (Mechanical, Electrical, etc.) to ensure proper size is provided to allow access to items beyond access panel. Adjust size as necessary to accomodate access. Locate and install additional access panels as needed.

D. Locate devices that require access above lay-in acoustical ceilings when possible. Provide access panel where necessary when behind gypsum board walls / ceilings.

E. Install frames plumb and level in openings, and secure units rigidly in place.

F. Position units to provide convenient access to concealed equipment when necessary.

G. Field paint access panels where necessary to match adjacent finishes.

END OF SECTION

SECTION 08 4123
FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Fire rated glazing and framing systems for installation as sidelights,

B. Verify other nearby items are specified. These include concrete and masonry inserts, concealed flashing.

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. Fire safety related:
      a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   2. Material related
      a. 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, Solution Hardened, and Bake Hardenable; 2007.
      b. 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, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)
   1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.
   1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 251: Fire Tests of Building Construction & Materials
   3. NFPA 252: Fire Tests of Door Assemblies
   4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies.
   2. UL 10 B: Fire Tests of Door Assemblies
   3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
   4. UL 263: Fire tests of Building Construction and Materials
   5. UL-752 Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

I. American Society of Civil Engineers (ASCE)
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

1.03 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.04 SUBMITTALS

A. Submit in accordance with Section .

B. Product Data:
   1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:
   1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure

D. Structural Calculations (optional):
   1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.

E. Samples (optional). For following products:
   a. Glass sample-as provided by manufacturer
   b. Sample of frame
   c. Verification of sample of selected finish

F. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

G. Warranties: Submit manufacturer's warranty.

H. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
   1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
   2. International Accreditation Service for Testing Body-Building Materials and Systems
      a. Fire Testing
         1) ASTM Standards E 119
         2) CPSC Standards 16 CFR 1201
         3) NFPA Standards 251, 252, 257
         4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
         5) BS 476; Part 22: 1987
         6) EN 1634-1
         7) CAN Standards S 101, S 104, S 106

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 252. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.

C. For 45-minute assemblies only.

D. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9. For 45-minute assemblies only.

E. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

F. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.07 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.

B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.08 WARRANTY

A. Provide the Pilkington Pyrostop® and Fireframes® standard five-year manufacturer warranty.

PART 2 – PRODUCTS

2.01 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site http://www.fireglass.com

B. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300 e-mail sales@fireglass.com web site http://www.fireglass.com

C. Doors: "Fireframes® Designer Series by TGP" fire-rated steel frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com web site http://www.fireglass.com.

D. Substitutions: Substitutions for Glazing Material and Frame System not permitted.

2.02 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Duration -- Doors: Capable of providing a fire rating for [60] minutes.
      a. When glazed with Pilkington Pyrostop 90 minutes glazing products, doors meet the maximum transmitted temperature rise of not more than 450 degrees Fahrenheit (250 degrees Celsius) at the end of 30 minutes of the standard fire test exposure.

B. Delegated design: For the performance requirements listed below requiring structural design provide data, calculations and drawings signed and sealed by an engineer licensed in the state [province] where the project is located.

C. Design Requirements:
   1. Dimensions – Door and Framing:
      a. Door framing face dimension: 1 15/16-inch.
      b. Depth of door framing: 1 15/16-inch.

c. Door style face dimension: 3 1/8-inch.
d. Door cross rail (if applicable) face: 3 9/16-inch.
e. Depth of stile, header, sill and cross rail: 1 15/16-inch

2. Construction: Narrow-profile, roll-formed steel architectural grade specialty fire doors. Conventional break-shape type hollow metal steel fire-rated doors will not be considered an acceptable substitute for the Fireframes Designer Series doors specified in this section as they do not conform to the project design intent and/or aesthetic and quality standards.
   a. Knock down frames are not permitted.
3. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format
   a. Face widths available:
      1) 2”
      2) Custom extruded aluminum cover caps
      3) Custom stainless steel cover caps
   b. Duration – Windows Capable of providing a fire rating for [45], [60], [120] minutes.
   c. Duration – Walls: Capable of providing a fire rating for [60], [120] minutes.

D. Structural Performance
   1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
   2. Accommodate movement between storefront and adjoining systems

E. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft2 at a static air pressure differential of 6.24 psf.

F. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.

G. Coordinate the lb/ft2 with those required in the field test at the end of the section.

2.03 MATERIALS - GLASS

A. Fire Rated Glazing (FG-1): Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.

B. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).

C. Properties Interior Glazing:
   1. Fire-Rating: 120 minute
   2. Manufacturer’s designation: 120-106
   3. Glazing type: IGU
   4. Nominal Thickness: 2-1/4” (57mm)
   5. Weight in lbs/sf: 22.9
   6. Daylight Transmission:75%
   7. Sound Transmission Coefficient: 46dB

D. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

E. Glazing Accessories: Manufacturer’s standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

2.04 MATERIALS –ALUMINUM FRAMES

A. Aluminum Framing System 120 min.
   1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
   2. Aluminum Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.

3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.
6. Glazing Gasket —
    a. Interior Gasketing-Supplied with the steel framing members. Nom. 3/4 in. (19 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.
    b. Exterior Gasketing- Supplied with the steel framing members. Nom. 2 in. (50 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
    1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M Standard Specification for Carbon Structural Steel
    2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
    3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
    1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
    2. Reinforce members as required to receive fastener threads.

2.05 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets:
    1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)

1. Available Products:
    a. Dow Corning 790, 795 - Dow Corning Corp.
    b. Momentive
    c. Tremco

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
    1. Available Products:
        a. 3M CP-25 WP+

2.06 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
    1. Fibrex Insulations Inc.
    2. Owens Corning
    3. Thermafiber.
    4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
    1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
    2. Fiber Color: Regular color, unless otherwise indicated.

2.07 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

C. Factory prepared, fire-rated steel door assemblies by TGP to be prehung, prefinished with hardware preinstalled for field mounting.

D. Field glaze door and frame assemblies.

2.08 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish frames after assembly.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.09 POWDERCOAT FINISHES

A. Finish after fabrication.

B. Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

C. Steel or Aluminum Finishes
    1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
    2. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
    3. Acceptable Manufacturers:
        a. Tiger Drylac
        b. Additional manufacturers as approved by TGP

D. Aluminum Finishes
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

2.10 DOOR HARDWARE

A. Furnish hardware with 90 minute fire door by the manufacturer.

B. Select hardware from door manufacturer's standard recommended and approved hardware groups as specified in Division 8 Section – Door Hardware.

C. Provide power assisted hardware for use at any door that cannot meet the opening force(s) required by code noted in Part I above.

D. High energy, power-operated doors must meet the requirements of ANSI/BHMA A156.10 and power-assisted low energy doors must comply with ANSI/BHMA A156.19

E. Operating hardware for Fireframes® Designer Series Single Outswing Doors with Exit Device. Each to have the following.

Qty.	Hardware List	Supplier Code
3 ea	CYLINDER, SCHLAGE MORTISE, 1 1/4" C-CORE KEYED DIFFERENT (FINISH 626)	20-001-C-KD-626
3 ea	ECIT DEVICE, VON DUPRIN, RIM STRIKE	QELA-35-A-L-F-626-3-LHR-360-06-626-CON-HMD
3 ea	CLOSER, LCN	4040XP-REGARM-689
3 ea	SMOKE SEAL, 36" DOOR BOTTOM	420APKL36
9 ea	PIVOT, WELD ON, DESIGNER	907662
3 ea	CENTER PIN, MILD STEEL	E2-001
3 ea	POWER TRANSFER, VON DUPRIN, 10 X 24GA WIRES (W 689 SPRAYED ALUMINUM FINISH)	EPT10-CON-SP28
3 ea	POWER SUPPLY, VON DUPRIN PS914, 4 AMP HIGH IN-RUSH	PS914-900-2RS
	Balance of hardware by others	

2.11 FINISH LEGEND:

1. Painted to match frame
2. Mill Finish Aluminum
3. Aluminum Paint
4. Satin Stainless Steel
5. Satin Chrome Plated

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer’s acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

3.02 INSTALLATION

A. See Fireframes Aluminum Series Installation Manual

3.03 REPAIR AND TOUCH UP

A. Anodized Finishes
   1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
   2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.
   3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.

B. Powder Coated Finishes
   1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
   2. Such repairs shall match original finish for quality or material and view.
   3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.04 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. Steam jets
      b. Abrasives
      c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. Detergents not recommended in writing by the manufacturer
      e. Do not use any detergent above 77 degrees F
      f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding doors.
   3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Section “Flush Wood Doors”.
   3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
   1. ANSI/BHMA Certified Product Standards - A156 Series.
   2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
   3. ANSI/UL 294 - Access Control System Units.
   4. UL 305 - Panic Hardware.
   5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware 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.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this

Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
   1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
   2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   3. Review sequence of operation narratives for each unique access controlled opening.
   4. Review and finalize construction schedule and verify availability of materials.
   5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check

Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.

d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
   1. Manufacturers:.
      a. Pemko (PE).

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
   1. Manufacturers:
      a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
      b. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Manufacturers:
      a. Pemko (PE) - SER-QC (# wires) Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
   1. Provide one each of the following tools as part of the base bid contract:
      a. McKinney (MK) - Electrical Connecting Kit: QC-R001.

b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

a. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

a. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:

a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.
1. Manufacturers:
a. Medeco (MC).

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
a. Sargent Manufacturing (SA) - 10X Line.
b. No Substitution.

2.9 INTELLIGENT WIFI ACCESS CONTROL

A. IP Enabled Wireless Integrated Card Reader Cylindrical Locks: IP enabled WiFi™ technology ANSI/BHMA A156.2 Grade 1 cylindrical lockset with integrated card reader and request-to-exit signaling in one complete unit. Separate DPS connects directly to lock electronics for door position (open/closed status) monitoring. Motor driven locking/unlocking control of the lever handle trim with 1/2" deadlocking stainless steel latch. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings.
1. Wireless access control mortise locks interface using field replaceable IEEE 802.11b/g/n 2.4 GHz wireless radio connection to an Ethernet Local Area Network (LAN), facilitating central control via a Software Development Kit (SDK). Locks will continue to operate independently of an Ethernet (LAN) connection slowdown or failure.
2. Fully-encrypted AES 128 wireless communication between IP enabled lock and access control system via the Software Development Kit (SDK). .

3. Integrated card reader supports HID® 125kHz proximity credentials; or ISO 14443 A/B and ISO 15693 13.56 MHz contactless credentials: HID® iCLASS (full authentication, all formats), MIFARE Classic, DESFire EV1 (full authentication, all formats); or Near Field Communications (NFC), Bluetooth Smart-enabled mobile phones.
4. Optional push-button keypad for PIN only usage or dual authentication requirements.
5. Configuration: Locks require a minimum of 2,400 user codes and the ability to audit the last 10,000 transactions. Programmable for time zone periods, holidays, and automatic unlock (with or without first entry).
6. Power Source: 6 AA alkaline batteries with LED indication of locked, programming mode and low capacity warning status conditions.
7. Complete installation to include Software Development Kit (SDK), and Lock Management Tool (LMT) kit for initial lock set-up. Electronic on-line access control system platform, including communication cabling and software, by others.
8. Manufacturers:
    a. Sargent Manufacturing (SA) - IN120-10 Line Series.
    b. No Substitution.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:
a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
e. Five-year limited warranty for electromechanical features.
2. Manufacturers:
a. Sargent Manufacturing (SA) - 80 Series.
b. No Substitution.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum

alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
    a. Sargent Manufacturing (SA) - 351 Series.
    b. No Substitution.

C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:
    a. Sargent Manufacturing (SA) - 1431 Series.
    b. No Substitution.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
    a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
    a. Rockwood (RO).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
    a. Rockwood (RO).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. Pemko (PE).

2.16 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
   1. Manufacturers:
      a. Securitron (SU) - DPS Series.

B. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.
   1. Manufacturers:
      a. Securitron (SU) - AQD Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. MR - Markar
4. RO - Rockwood
5. SA - SARGENT
6. RI - RITE Door
7. OT - Other
8. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 101

Description: STOREFRONT SGL CARD READER RATED

1	Continuous Hinge	CFM x Height Req x SLF-HD1 SER12		PE	087100
1	Rim Exit Device, REX, MELR	12 55 56 70 8804 ETL	US32D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
1	Surface Closer w/ Stop	1431 CPS	EN	SA	087100
1	Perimeter Seals	By Storefront Mfr		OT	
1	ElectroLynx Harness	QC-C2500P		MK	087100

1	ElectroLynx Harness	QC-C**** x Length Required		MK	087100
1	Position Switch	DPS-M-GR		SU	087100
1	Power Supply	AQD x Amps Required		SU	087100
1	Card Reader	By Security Contractor		OT	

Notes: CARD READER RELAYED TO FIRE ALARM. ENTRY VIA PRESENTATION OF AUTHORIZED PROXIMITY CREDENTIAL OR MECHANICAL KEY OVERRIDE. REQUEST-TO-EXIT INTEGRATED IN LATCHING HARDWARE. DOOR STATUS MONITORED. FREE EGRESS AT ALL TIMES.

Set: 2.0

Doors: 201

Description: WD/HM SGL CARD READER RIM EXIT

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Rim Exit Device, Wireless, Card Reader	70 IN100-8877-BIPS ETL	US32D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
1	Surface Closer w/ Stop	1431 CPS	EN	SA	087100
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO	087100
1	Gasketing	S88BL Head x Jambs		PE	087100

Set: 3.0

Doors: 202

Description: HM PAIR A/I CARD READER RATED

6	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Flush Bolt Set	2842	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Cyl Lock, Wireless, Card Reader	70 IN100-10G77-BIPS LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
1	Coordinator	2672 x Bracket as Req.	US28	RO	087100
2	Surface Closer	1431 UO	EN	SA	087100
1	Astragal	18041CNB		PE	087100
2	Kick Plate (Pairs)	K1050 10" x 1" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	409	US32D	RO	087100
1	Gasketing	S88BL Head x Jambs		PE	087100

Notes: ENTRY VIA PRESENTATION OF AUTHORIZED PROXIMITY CREDENTIAL OR MECHANICAL KEY OVERRIDE. REQUEST-TO-EXIT INTEGRATED IN LATCHING HARDWARE. DOOR STATUS MONITORED. FREE EGRESS AT ALL TIMES.

Set: 4.0

Doors: C002, C005

Description: HM PAIR A/I CARD READER

6	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Dust Proof Strike	570	US26D	RO	087100
2	Flush Bolt	555	US26D	RO	087100
1	Cyl Lock, Wireless, Card Reader	70 IN100-10G77-BIPS LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
2	Surface Closer	1431 UO	EN	SA	087100
1	Astragal	18041CNB		PE	087100
2	Kick Plate (Pairs)	K1050 10" x 1" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	409	US32D	RO	087100
2	Silencer	608-RKW		RO	087100

Notes: ENTRY VIA PRESENTATION OF AUTHORIZED PROXIMITY CREDENTIAL OR MECHANICAL KEY OVERRIDE. REQUEST-TO-EXIT INTEGRATED IN LATCHING HARDWARE. DOOR STATUS MONITORED. FREE EGRESS AT ALL TIMES.

Set: 5.0

Doors: C001

Description: WD/HM SGL CARD READER

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Cyl Lock, Wireless, Card Reader	70 IN100-10G77-BIPS LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
1	Surface Closer	1431 UO	EN	SA	087100
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608-RKW		RO	087100

Notes: ENTRY VIA PRESENTATION OF AUTHORIZED PROXIMITY CREDENTIAL OR MECHANICAL KEY OVERRIDE. REQUEST-TO-EXIT INTEGRATED IN LATCHING HARDWARE. DOOR STATUS MONITORED. FREE EGRESS AT ALL TIMES

Set: 6.0

Doors: 102, 103

Description: WD/HM SGL CARD READER CLOSER/STOP

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Cyl Lock, Wireless, Card Reader	70 IN100-10G77-BIPS LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100

1	Surface Closer w/ Stop	1431 CPS	EN	SA	087100
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO	087100
3	Silencer	608-RKW		RO	087100

Notes: ENTRY VIA PRESENTATION OF AUTHORIZED PROXIMITY CREDENTIAL OR MECHANICAL KEY OVERRIDE. REQUEST-TO-EXIT INTEGRATED IN LATCHING HARDWARE. DOOR STATUS MONITORED. FREE EGRESS AT ALL TIMES

Set: 7.0

Doors: C003

Description: WD PAIR A/I STOREROOM FUNCTION

6	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Dust Proof Strike	570	US26D	RO	087100
2	Flush Bolt	555 / 557 (As Required)	US26D	RO	087100
1	Storeroom/Closet Lock	70 10XG04 LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
2	Surface Closer	1431 UO	EN	SA	087100
1	Astragal	18041CNB		PE	087100
2	Kick Plate (Pairs)	K1050 10" x 1" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	409	US32D	RO	087100
2	Silencer	608-RKW		RO	087100

Set: 8.0

Doors: C004

Description: WD SGL STOREROOM FUNCTION

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Storeroom/Closet Lock	70 10XG04 LL	US26D	SA	087100
1	Cylinder/Core	Key System to Match Existing			087100
1	Surface Closer	1431 UO	EN	SA	087100
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608-RKW		RO	087100

Set: 9.0

Doors: 200, 203

Description: WD PAIR (INTEGRATED RECESSED HDW) MAG HOLD OPEN

2	Continuous Hinge	HG315 HT w/ Door Edge	630	MR	087100
2	Recessed Exit	D3676	US32D	RI	081700
2	Trim	D3080-L	US32D	RI	

2	Surface Closer (Recessed)	D-DCT-351PKT90	EN	RI	081700	
2	Kick Plate	K1050 10" x 1" LDW CSK BEV	US32D	RO	087100	
2	Electromagnetic Holder	D-MDH-102	689	RI	081700	
1	Meeting Stile Seal	D-SS44-STK		PE	087100	
1	Gasketing	D-SS-STK Frame		PE	087100	

Notes: MAG HOLD OPENS TO BE RELAYED TO FIRE ALARM.

Set: 10.0

Doors: SYSTEM ACCESSORIES
Description: SYSTEM ACCESSORIES

1	Hub	AH30R12		SA	087100	

Notes: QUANTITY TO BE DETERMINED.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL V.22

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units to be installed in window opening or door assemblies.

C. Fire-resistant rated and Fire-Protection rated glazing.

D. Glazing compounds and accessories.

E. Unframed glass or mirrors applied directly to wall surfaces.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

K. GANA (GM) - GANA Glazing Manual; 2022.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

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

O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

P. ITS (DIR) - Directory of Listed Products; Current Edition.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

R. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

U. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

V. UL (DIR) - Online Certifications Directory; Current Edition.

W. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

X. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Z. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit one sample 12 by 12 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

1.06 MOCK-UPS

A. Provide mock-up of window assembly including glass and air barrier and vapor retarder seal.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agcglass.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Fire-Resistance-Rated and Fire-Protection-Rated Glass: Provide products as required to achieve indicated fire-rating period.

1. Manufacturers:
2. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
3. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.
4. Vetrotech North America; Contraflam: www.vetrotechusa.com/#sle.

C. Mirrored Glass Manufacturers:
1. Pilkington North America Inc; Pilkington Mirropane Transparent Mirror: www.pilkington.com/na/#sle.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Design Pressure: Calculated in accordance with ASCE 7 or no less than as indicated on structural plans for building ultimate wind speed.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/200 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
1. In conjunction with vapor retarder and joint sealer materials described in other sections.
2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
5. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Any of the manufacturers specified for float glass.
2. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision

glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
6. Color: Black.
7. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Typical all Exterior glazing unless otherwise indicated
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.29, nominal.
7. Visible Light Transmittance (VLT): 54 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.28, nominal.

D. Type IG-2 - Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Same as on vision units, on #2 surface.
4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
   a. Opacifier: Ceramic frit, on #4 surface.
   b. Opacifier Color: to be selected by Architect.
   c. Opacifier may be exposed on interior; apply sufficient coats of opacifier to achieve 100% even spaced coverage when viewed from interior.
5. Total Thickness: 1 inch.
6. Glazing Method: Dry glazing method, gasket glazing.

E. Type IG-3 - Insulating Glass Units: Safety glazing.
1. Applications: provide this type of glazing in the following locations:
   a. Glazed lites in all exterior doors.
   b. Glazed sidelights and panels next to doors.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on drawings.
2. Space between lites filled with air.
3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.

2.05 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
1. Applications: Tyipcal Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.
5. Glazing Method: Dry glazing method, gasket glazing.

B. Type G-3 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
   1. Applications:
      a. Glazing in fire-rated door and window assemblies.
      b. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
   2. Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers, or other pre-approved type that meets rating and testing requirements.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: 60 minutes or greater as required by drawings.
   7. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
      a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
      b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
      d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
      e. "XXX" - placeholder that represents fire-rating period, in minutes.

C. Type G-4 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period of 45 minutes or less.
   1. Applications:
      a. Glazing in fire-rated door and window assemblies.
      b. Other locations as indicated on drawings.
   2. Glass Type: Specialty tempered float glass with modifications such as surface applied films as necessary or required.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: 45 minutes or less as indicated on drawings.
   7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
      a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
      d. "XXX" - placeholder that represents fire-rating period, in minutes.

D. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications: Provide this type of glazing in the following locations, non-fire rated:
      a. Glazed lites in interior doors and sidelights.
      b. Other locations required by applicable federal, state, and local codes and regulations.

c. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear or as indicated.
4. Thickness: 1/4 inch, nominal.

E. Type M-1 - Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
1. Applications: Locations as indicated on drawings.
2. Thickness: 1/4 inch.
3. Glass Tint: None..
4. Glass Type: Fully tempered.

2.06 GLAZING COMPOUNDS

A. Manufacturers:
1. BASF Corporation: www.basf.com/#sle.
2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
3. Pecora Corporation: www.pecora.com/#sle.
4. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

F. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building. Follow window assembly manufacturer instructions for placement of glazing.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact. Apply sealant at corners as necessary to ensure gasket has full contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact. Apply sealant at corners as necessary to ensure gasket has full contact.

G. Carefully trim protruding tape with knife.

3.06 INSTALLATION - MIRRORS

A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirros with edge clearance free of surrounding construction including countertops or backsplashes.

3.07 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Carpet tile.
   4. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Patching compound.

G. Remedial floor coatings.

H. Remedial floor sheet membrane.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.04 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.

4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by Owner.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: 1/8 inch, maximum.

2. Products:
    a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
    b. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: www.floorseal.com/#sle.
    c. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com/#sle.
    d. Tnemec Company, Inc; Series 208 Epoxoprime MVT: www.tnemec.com/#sle.

C. Remedial Floor Sheet Membrane: Pre-formed multi-ply sheet membrane installed over concrete subfloor and intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
    1. Thickness: 28 mil (0.028 inch).
    2. Tape: Types recommended by underlayment manufacturer to install membrane and cover seams.
    3. Products:
        a. GCP Applied Technologies; Kovara MBX: www.gcpat.com/#sle.
        b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
    1. Preliminary cleaning.
    2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
    3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
    4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
    5. Specified remediation, if required.
    6. Patching, smoothing, and leveling, as required.
    7. Other preparation specified.
    8. Adhesive bond and compatibility test.
    9. Protection.

B. Remediations:
    1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
    2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
    3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

A. Install in accordance with sheet membrane manufacturer's instructions.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal partition and soffit framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Framing Accessories.

1.02 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

J. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

M. ASTM E413 - Classification for Rating Sound Insulation; 2022.

N. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

O. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.

P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
   1. Indicate special details associated with fireproofing and acoustical seals.

2. Indicate component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
3. Describe method for securing studs to track, splicing, and for blocking and reinforcing of framing connections.
4. Provide partition legend indicating proposed assembly components at each partition type.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system. Include framing load charts and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

1.05 MOCK-UP

A. Provide mock-up of stud wall, ceiling, and soffit framing including insulation, sheathing, window frame, and door frame and finish specified in other sections. Coordinate installation of associated work specified in other sections.
1. Mock-up may remain part of finish work.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic and/or STC on partition schedule: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
2. Treat all penetrations and perimeters of wall assembly with acoustical sealant, both sides of wall.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

E. Fire Rated Assemblies: Provide completed assemblies as indicated on partition schedule and complying with applicable code.
1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
1. ClarkDietrich: www.clarkdietrich.com/#sle.

2. Marino: www.marinoware.com/#sle.
3. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf, with steel thickness not less than 20 gauge (30 mils). Adjust steel thickness to comply with deflection with stud heights. Walls with tile or masonry veneer, comply with deflection of wall framing of L/360 at 5psf.
1. Studs: "C" shaped with knurled or emobossed faces.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

E. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs.

F. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

G. Metal Framing Fasteners: ASTM C1002 self-piercing tapping screws.

H. Sheet Metal Backing: 0.036 inch thick, galvanized.

I. Partial Height partitions: Use steel wall stiffeners bolted to floor surface and stud framing at 48" o.c., minimum of two per wall. Provide No-Flex Stud Stiffeners, or approved equal. www.noflex.com.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
3. National Gypsum Company: www.nationalgypsum.com/#sle.
4. Temple-Inland Building Product by Georgia-Pacific, LLC: www.temple.com.
5. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for standard vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
   b. Mold resistant board is required at all toilet rooms, janitor closets, laundry rooms, kitchen and similar wet areaat all wet locations such as: Locker, shower, toilet rooms, kitchens, janitor closets, etc and behind plumbing fixtures locations. Also refer to partition schedule and locations otherwise noted.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
   a. Vertical Surfaces: 5/8 inch.
   b. Ceilings: 5/8 inch., sag resistant.
5. Paper-Faced Products:
   a. American Gypsum Company; LightRoc Gypsum Wallboard.

b. Georgia-Pacific Gypsum; ToughRock.
c. Georgia-Pacific Gypsum; ToughRock Fireguard X.
d. Georgia-Pacific Gypsum; ToughRock Fireguard C.
e. Substitutions: See Section 01 6000 - Product Requirements.

6. Mold Resistant Paper Faced Products:
a. American Gypsum Company; M-Bloc.
b. Continental Building Products; Mold Defense Type X.
c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
e. National Gypsum Company; Gold Bond XP Gypsum Board.
f. Lafarge North America Inc; Mold Defense Drywall.
g. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
h. Temple-Inland Building Product by Georgia-Pacific, LLC; ComfortGuard Mold Resistant Gypsum Board.
i. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.

C. Exterior Sheathing Board: As specified in Section 06 1000.

D. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

D. Water-Resistive Barrier: As specified in Section 07 2500.

E. Finishing Accessories: ASTM C1047, galvanized steel, pre-approved rigid plastic, rolled zinc, pre-approved rigid plastic, or pre-approved rigid plastic, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
3. Products:
a. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
b. Trim-tex, Inc: www.trim-tex.com/#sle.
c. Fry Reglet Corporation; www.fryreglet.com
d. Substitutions: See Section 01 6000 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, vinyl-based, ready-mixed.
4. Joint Compound: Setting type, field-mixed.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

2.05 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Verify existing conditions before starting work.

C. Verify that rough-in utilities are in proper location.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
   1. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center or as otherwise scheduled.
   1. Extend partition framing to structure in all locations or as otherwise specifically noted on partition schedule.
   2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
   3. Align stud web openings horizontally.
   4. Secure studs to track using fastener method. Do not weld.
   5. Stud splicing is not permissible.
   6. Fabricate corners using a minimum of three studs.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jamb, not more than 2 inches from each side of opening. Refer to framing details on plans.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
   1. Orientation: Horizontal.
   2. Spacing: As indicated.

F. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

H. Blocking: Coordinate installed bucks, support systems, anchors and blocking with electrical, mechanical and other work to be placed within or behind stud framing. Install wood blocking for support of:
   1. Wall-mounted cabinets.

2. Plumbing fixtures.
3. Toilet partitions.
4. Toilet accessories.
5. Wall-mounted door hardware.

3.04 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflections to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap spice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls and rigid secure. Lap splices securely.

G. Laterally brace suspension system.

3.05 ACOUSTIC ACCESSORIES INSTALLATION

A. Install insulation material type as indicated in 07 2100 into partition cavities.

B. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.06 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Mold Resistant Gypsum Board: Use at all wall and ceiling surfaces in toilet rooms, janitor closets, laundry rooms, kitchens, and similar wet areas not indicated to receive wall tile.
1. At single plumbing fixtures locations: Install from floor to 24 inches vertically above fixture and 12 inches horizontally past edge of fixture.

F. Tile Backer Board: Install at all locations scheduled to receive tile. Seal all joints penetrations through backer board with sealant. Install in accordance with ANSIO A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

H. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.07 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. Not more than 30 feet apart on ceiling over 50 feet long and/or where framing changes directions.
   3. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on the drawings. Provide vent area specified or no less than 1/150 of area vented.

3.08 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, walls behind specialty dry-erase coatings and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction. Installation must conform to UL or STC ratings at Fire Rated and Acoustical Partitions.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
   3. Taping, filling and sanding is not required at base layer of double layer applications, unless required by UL fire resistance rating.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.09 QUALITY CONTROL

A. Prior to installation of wall board on stud walls, coordinate review with Architect and AHJ inspections and approvals.

B. Prior to covering up with suspended ceilings, coordinate above ceiling review with Architect. Review to observe installation of acoustical sealant, fire wall installation and labels, mechanical equipment installation and clearances, etc. Coordinate with AHJ inspections and approvals.

3.10 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed. Provide at a minimum 1 box or carton of ceiling tile.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. USG Corporation: www.usg.com/ceilings/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
2. Size: 24 by 24 inches.
3. Thickness: 1 inches.
4. Composition: Wet felted.
5. Light Reflectance: 88 percent, determined in accordance with ASTM E1264.
6. NRC: 95 determined in accordance with ASTM E1264.
7. Ceiling Attenuation Class (CAC): N/A, determined in accordance with ASTM E1264.
8. Panel Edge: Square Tegular.
9. Surface Pattern: Fine Texture.
10. Color: White.
11. Suspension System: 15/16 Prelude Exposed grid.
12. Edge Details: Where ACT-01 meets gypsum wallboard, use Shadow Reveal Transition molding, Basis of design, Armstrong 7902
13. Products:
a. Armstrong World Industries, Inc; Optima 3250: www.armstrongceilings.com/#sle.

C. Acoustical Panels, Type ACT-02: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
2. Size: 24 by 24 inches.
3. Thickness: Match existing ceiling tile found in the Capitol basment level adjacent to new construction.
4. Composition: Wet felted.
5. Panel Edge: Square Tegular.
6. Color: White.
7. Surface Pattern: Fine Texture.
8. Suspension System: 15/16 Exposed grid, match existing suspension system found in the Capitol basment level.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap; factory-applied closed-cell foam gaskets.
1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
2. Profile: Tee; 15/16 inch face width.
3. Finish: Baked enamel.
4. Products:

a. USG Corporation; Donn Brand DXLA/DXCE 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
b. Armstrong: Prelude XL 15/16" Exposed Tee. www.armstrongceilings.com.
c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
1. Where ACT-01 meets gypsum wallboard, use Shadow Reveal Transition molding, Basis of design, Armstrong 7902
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

D. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

E. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9200.

F. Touch-up Paint: Type and color to match acoustical ceiling tiles and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Coordinate and verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.
2. Double cut and field paint exposed reveal edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. At partitions that extend only to underside of ceiling grid, lay acoustical insulation for a distance of 48 inches either side of acoustical partitions.

H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Resilient tile and sheet flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

F. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

H. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

I. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

J. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Mockup: may be required from installer to convey installation of componets with accessories.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 percent or 45 square feet of each type and color.
   3. Extra Wall Base: 20 linear feet of each type and color.
   4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect roll materials from damage by storing on end.

1.05 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

2.02 TILE FLOORING

A. Luxury Vinyl Tile - Type LVT-01: Solid vinyl with color and pattern throughout thickness. Non-ortho Phthalate.
   1. Manufacturers:
      a. Mannington Commercial; www.manningtoncommercial.com
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Plank Tile Size: 12 x 24 inches
   4. Wear Layer Thickness: 20 mil (0.51 mm)
   5. Wear Layer: Quantum Guard Elite®
   6. Total Thickness: 0.098” (2.5 mm)
   7. Edge: Unbevel
   8. Pattern: Basis of design, Stride.
   9. Color: To be selected by Architect from manufacturer's full range.

2.03 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Material: Homogeneous composition of 100% synthetic rubber, high quality additives, and colorants to meet the performance, requirements of ASTM F2169 Standard Specification for Resilient Stair Treads, Type TS, Class 1 and 2, Group 1 and 2.
   2. Nosing: Contractor to provide nosing style that best accomodates specified metal pan. Options, square or round nose.
   3. Texture: Hammered.
   4. Color: To be selected by Architect from manufacturer's full range.

2.04 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      b. Roppe Corp: www.roppe.com/#sle.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: To be selected by Architect from manufacturer's full range.
   7. Accessories: Premolded external corners and internal corners.

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Leveling and Patching compound: As recommended by flooring manufacturer.

C. Moisture Membrane: As required or recommended by flooring manufacturer.

D. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer based on application type.

1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.
2. Provide product compatible with concrete subfloor relative humidity and ph levels.

E. Moldings, Transition and Edge Strips: Resilient transitional mouldings are manufactured from a homogeneous composition of polyvinyl chloride (PVC), high quality additives, and colorants. All transitional mouldings comply with A.D.A. requirements of Section 4.5.2 Changes of Level.
1. Products: Basis of design, Tarket Metal Edge

F. Filler for Coved Base: Plastic.

G. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates have fully cured and ready for resilient flooring installation by testing for moisture, pH and compression strength.
1. Test as Follows:
a. Alkalinity (pH): ASTM F710.
b. Internal Relative Humidity: ASTM F2170.
c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
3. Verify cementitious sub-floor and any fillers have reached minimum 3000 psi strength.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers. Remove curing compounds, surface hardeners or other chemicals that may interfere with adhesive bonding. Where subfloor moisture levels are higher than acceptable installation range, prepare or condition space as necessary to permit installation. The use of moisture barrier membrane is acceptable.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door. Where flooring is similar, continue seamlessly through opening.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Provide nosings at corners of floor plane transtions such as at steps..

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

F. Featherstone materials, not equal in height, at least 24 inches.

G. Install flooring in recessed floor access covers, maintaining floor pattern.

H. At movable partitions, install flooring under partitions without interrupting floor pattern.

I. Install feature strips where indicated.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install tile to match patterns as indicated on drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Use coil stock when available and install in longest runs with minimal joints possible.

B. Miter internal corners. At external corners, use premolded units. .

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Seal and Wax resilient flooring with two coats and/as recommended by manufacturer. For products that do not require wax, provide temporary protection until project completion.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Accessory Samples: Submit two samples of edge strip, base cap, and stair nosing.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Interface, Inc: www.interface.com/#sle.

2. Mannington Commercial: www.manningtoncommercial.com#sle.
3. Mohawk Group: www.mohawkgroup.com/#sle.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-01: Tufted, manufactured in one color dye lot.
1. Product: Basis of design; Color Anchor II manufactured by Mannington Commercial.
2. Tile Size: 24 by 24 inch, nominal.
3. Pile Thickness: 0.091 (2.31 mm) inch.
4. Color: to be selected from manufacturers full line of color.
5. Construction: Patterned Loop
6. Face Fiber: Type 6,6 Nylon
7. Dye Method: Solution
8. Gauge: 1/12 (47.24 per 10 cm)
9. Stitches Per Inch: 9.33 (36.73 per 10 cm)
10. Density: 5,934 (220.50 kg/m3)
11. Primary Backing Material: Infinity® 2 Modular
12. Total Weight: 15 oz/yd2 (509 g/m2)
13. Adhesive: Infinity 2 Adhesive

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Basis of design; Tarket Metal Edge.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.
1. Infinity 2 Adhesive

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 0561.
2. Test as Follows:
a. Alkalinity (pH): ASTM F710.
b. Internal Relative Humidity: ASTM F2170.
c. Moisture Vapor Emission: ASTM F1869.
3. Conduct tests by an independent testing agency acceptable to Owner.
4. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile, if applicable.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2023.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 2018.

G. SSPC-SP 3 - Power Tool Cleaning; 2018.

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 3 feet long by 3 feet wide, illustrating each paint color, texture, and finish.

C. Provide mock-up on-site of each accent paint colors selected by Architect, minimum 3 feet long by 3 feet wide, in location as directed by Architect. Accent colors to be reviewed by Architect for final approval PRIOR to accent painting starting. Proceeding with Accent painting without approval is done so at Contractor's own risk.

D. Provide door and frame assembly illustrating paint color, texture, and finish.

E. Locate where directed by Architect.

F. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin Williams Company.
   2. Behr Process Corporation: www.behr.com/#sle.
   3. PPG Paints: www.ppgpaints.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Block Fillers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Colors: As indicated on drawings.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer. PrepRite ProBlock Latex Primer Sealer B51 Series
   2. Semi-gloss: Two coats of latex enamel; Pro Industrial Acrylic Semi Gloss B66-650 Series.

B. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
   1. One coat of stain; Wood Clasics 250 Stain A49-800 Series.
   2. One coat sealer.
   3. Satin: Two coats of varnish; Waterborne Polyurethane Satin A68 Series.

C. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of acrylic primer. ProCryl Universal Primer B66-310 Series
   2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi-Gloss B66-650 Series.

D. Paint MI-OP-2A - Ferrous Metals, Primed, Acrylic, 2 Coat:
   1. Touch-up with recommended primer.
   2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi Gloss B66-650 Series.

E. Paint MI-OP-2L - Ferrous Metals / Roof Deck / Exposed Interior Structure, Primed, Latex, 2 Coat:
   1. Touch-up with recommended primer. Pro-Cryl B66-310 Series
   2. Semi-gloss: Two coats of water borne acrylic dryfall Pro Industrial Semi Gloss B42-80 Series. .

F. Paint CI-OP-3E - Concrete/Masonry, Epoxy Enamel, 3 Coat:
   1. One coat of catalyzed epoxy primer. Loxon Block Surfacer A24W200

2. Gloss: Two coats of catalyzed epoxy enamel: Full Gloss. Pro Industrial Precatalyzed Gloss Epoxy B73-300 Series .

G. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of alkyd primer sealer. ProMar 200 Primer B28W2600 Series
2. Semi-gloss: Two coats of latex enamel.
3. Eggshell: Two coats of latex enamel; ProMar 200 B20-2600 Series.
4. Flat: Two coats of latex enamel; B30-2600 Series (ceilings).

H. Paint GI-OP-3M - Gypsum Board/Plaster, Epoxy Enamel, 3 Coat:
1. One coat of latex primer sealer. ProMar 200 Latex Primer B28W2600 Series
2. Gloss: Two coats of water based catalized epoxy enamel; Pro Industrial Epoxy B73-300 Series.

I. Paint FI-OP-3A - Fabrics/Insulation Jackets, Alkyd, 3 Coat:
1. One coat of alkyd primer sealer.
2. Eggshell: Two coats of alkyd enamel.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

L. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9723
CONCRETE AND MASONRY COATINGS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Moisture resistant textured concrete and masonry coatings installed on surface of exposed exterior concrete foundations and masonry walls.

1.02 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

B. ASTM D522/D522M - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings; 2017 (Reapproved 2021).

C. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2022.

D. ASTM D2243 - Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings; 2020.

E. ASTM D6904 - Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry; 2003 (Reapproved 2022).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

H. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials.

C. Samples: Submit two samples 4 by 4 inch in size illustrating colors and textures available for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.05 FIELD CONDITIONS

A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete and Masonry Coatings:
   1. Sto Corp; StoColor Acryl Plus: www.stocorp.com/#sle.
   2. Textured Coatings of America, Inc: www.texcote.com/#sle.
   3. BASF; Masterprotect HB 400. (Formerly Thorocoat). www.master-builder-solutions.basf.us
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 CONCRETE AND MASONRY COATINGS

A. Provide high-build, weather resistant coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
   1. Salt Spray Resistance: Passes when tested according to ASTM B117 for 2000 hours.
   2. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
   3. Accelerated Outdoor Exposure: Passes when tested according to ASTM G153 for 5,000 hours.

2.03 MATERIALS

A. Coatings - General: Provide complete systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated.

B. High Build, One Coat, Water Based Textured Coating for 'Green' Concrete: Water based, epoxy-acrylic resin with graded perlite aggregate.
   1. Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.
   2. Dry Film Thickness: 15 mils, minimum.
   3. Flexibility Test: Passing, when tested according to ASTM D522/D522M with a 1 inch mandrel.
   4. Abrasion Resistance: Passing, when tested according to ASTM D968 with 792 gallons of falling sand.
   5. Freeze Thaw Resistance: Passing, when tested according to ASTM D2243 for 50 cycles.
   6. Wind Driven Rain Resistance: Passing, when tested according to ASTM D6904 at 98 miles per hour for 24 hours.
   7. Water Vapor Transmission: 20 perms, maximum, when tested in accordance with ASTM E96/E96M.
   8. Color: From full range of manufacturer's standard colors..
   9. Texture: Sand.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.

D. Masonry: Verify masonry joints are struck flush.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Concrete and Masonry: Prior to priming, patch holes and indentations and fill cracks with manufacturer's recommended crack repair material.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 2601
WALL AND CORNER GUARDS

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Corner guards.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions.

C. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall and Corner Guards:
   1. Inpro: www.inprocorp.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Corner Guards - Flush Mounted:
   1. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   2. Width of Wings: 3 inches.
   3. Corner: Square.
   4. Color: As selected from manufacturer's standard colors.
   5. Length: One piece.

B. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

B. Position corner guard 4 inches above finished floor to 60 inches high.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL V.20

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
   2. Pyro-Chem, a Tyco Business: www.pyrochem.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Cartridge Operated: Spun shell.
   2. Class: A:B:C type.
   3. Size: 20 pound.
   4. Temperature range: Minus 65 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Configuration: Semi-recessed type, coordinate with wall cavity depth.
   1. Size to accommodate accessories.

B. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

C. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

E. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

F. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions per NFPA and ADA standards.
   1. Handle for Fire Extinguisher Cabinet shall not be installed higher than 52" above finished floor.
   2. The top of the Fire Extinguisher mounted inside of Cabinet shall not be higher than 60" above finished floor.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

END OF SECTION

SECTION 12 1230
ART HANGING AND DISPLAY SYSTEMS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Include details of construction, and relationship with adjacent construction.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square representing actual product, color, and patterns.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Remodel mock-up area as required to produce acceptable work.

1.04 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.07 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.08 WARRANTY

A. Warranty: Submit manufacturer's standard limited one year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: AS Hanging Display Systems, which is located at: 8396 State Route 9; West Chazy, NY 12992 ; Toll Free Tel: 866-935-6949 ; Email: request info (info@ashanging.com); Web: www.ashanging.com

B. Web: http://www.ashanging.com.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 HANGING AND DISPLAY SYSTEM

A. Contempo® System as manufactured by AS Hanging Display Systems. Provide materials and components required to provide a complete system by AS Hanging Display Systems for hanging corporate branding, display materials, informational and directional signage, art and regulatory notices, with conforming track as indicated or scheduled. Refer to Drawings.
   1. Configuration: Suspended Cable/Rod.
   2. Aesthetic: High design for public
   3. Contempo Track: Open-face.
   4. Track Weight Capacity: minimum of 78 lb./6 foot track.
   5. Vertical Component: Stainless steel cables

B. Wall Segments: The track shall adapt to wall segments with a radius as small as 2 feet and work on concave, convex, serpentine and straight walls.

C. Contempo Wall Track: Aluminum. (patented)
   1. Finish: Silver, satin anodized.

D. Vertical Component/Cable:
   1. Material: Contempo Cable Stainless Steel. (Hanger color to match track) Minimum weight capacity; 45 lbs.
   2. Cable Length: 48 inches.

E. Hangers: Provide manufacturer's recommended type and quantity of hooks.
   1. C-Hanger – Finish: Silver, satin anodized
   2. Utility Hooks

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

3.04 CLEANING

A. Clean installed system and remove excess materials.

B. Deliver any unused cable and fittings to Owner.

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

SECTION 14 2100
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies electric traction elevators.

B. Work Required
   1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
   2. All work shall be performed in a first class, safe and workmanlike manner.
   3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as required to make complete installation.

1.02 RELATED SECTIONS

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.
   1. Section 01 50 00 – Temporary Facilities and Controls: protection of floor openings and personnel barriers; temporary power and lighting.
   2. Section 03 30 00 – Cast-In-Place Concrete: elevator pit and elevator machine foundation.
   3. Section 04 20 00 – Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
   4. Section 05 50 00 – Metal Fabrications: pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.
   5. Section 07 16 00 – Cementitious Waterproofing: waterproofing of elevator pit.
   6. Section 23 50 00 – Heat Generation Equipment: ventilation and temperature control of elevator equipment areas.
   7. Section 26 05 00 – Common Work Results for Electrical:
      a. Main disconnects for each elevator.
      b. Electrical power for elevator installation and testing.
      c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
      d. The installation of dedicated GFCI receptacles in the pit and overhead.
      e. Lighting in controller area, machine area and pit.
   8. Wiring for telephone service to controller.
   9. Section 26 30 00 – Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.
   10. Section 27 30 00 – Voice Communications: ADAAG-required emergency communications equipment.
   11. Section 28 31 00 – Fire Alarm Systems: fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area.
   12. Section 31 10 00 – Site Clearing: excavation for elevator pit.

1.03 REFERENCES

A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:
   1. ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
   2. ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.
   3. ADAAG, American Disabilities Act Accessibility Guidelines.
   4. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
   5. ANSI/NFPA 70, (NEC) National Electrical Code.
   6. CAN/CSA C22.1, (CEC) Canadian Electrical Code.
   7. ANSI/UL 10B, Standard for Fire Test of Door Assemblies.

8. CAN/ULC-S104-10, Standard Method for Fire Test of Door Assemblies.
9. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.
10. Building Codes IBC or NBCC.
11. All Local Jurisdictional applicable codes.

1.04 SYSTEM DESCRIPTION

A. Equipment Description: Gen3 Edge™ gearless machine-room less elevator where all components fit inside the hoistway with the controller in the top landing entrance frame.

B. Equipment Control: Elevonic® Control System.

C. Drive: Regenerative

D. Quantity of Elevators: 1

E. Elevator Stop Designations: 1, 2

F. Stops: 2

G. Openings: Front Only

H. Travel: 15’-0”

I. Rated Capacity: 3500

J. Rated Speed: 150 fpm

K. Platform Size: 6’-6 3/4” W x 6’-8 3/16” D

L. Clear Inside Dimensions: 6' 5 9/16" x 5' 5 9/16"

M. Cab Height: 93”

N. Clear Cab Height: 7’-4 5/16” (2243 mm)

O. Entrance Type and Width: Single Slide - 3'6"

P. Entrance Height: 84”

Q. Main Power Supply: 480 volts.

R. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.

S. Machine Location: Inside the hoistway at the top of the hoistway.

T. Signal Fixtures: Manufacturer’s standard with metal button targets (excluding CA).

U. Controller Location:

V. Performance:
   1. Car Speed: 3 % of contract speed under any loading condition or direction of travel.
   2. Car Capacity: Safely lower, stop and hold up to 120% of rated load (code required).
   3. Ride Quality:
      a. Vertical Vibration (maximum): 20 milli-g
      b. Horizontal Vibration (maximum): 12 milli-g
      c. Vertical Jerk (maximum): 4.59/ sec3
      d. Acceleration/Deceleration (maximum): 2.62 ft./ sec2
      e. In Car Noise: 55 – 60 dB(A)
      f. Stopping Accuracy: 0.25 in. Typical
      g. Re-leveling Distance: 0.5 in.

W. Operation: Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served. Operation Features – Standard
   1. Full Collective Operation
   2. Anti-nuisance.
   3. Fan and Light Protection.
   4. Load Weighing Bypass.

5. Independent Service.
6. Firefighters' Service Phase I and Phase II (USA only); or Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation (Canada only).
7. Top of Car Inspection.

X. Operation Features – Optional
1. Zoned Access at Bottom Landing.
2. Zoned Access at Upper Landing.
3. Express Priority Service with key-switch(es)
4. Emergency Hospital Service.
5. Automatic Rescue Operation
6. Automatic Standby Power Operation with Manual Override.

Y. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
3. Door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

Z. Provide equipment for seismic conditions: No

1.05 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.06 QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Manufacturer shall have a minimum of fifteen years of experience in the fabrication, installation and service of elevators.

C. Installer: Elevators shall be installed by the manufacturer.

D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

B. Should the storage area be off-site, and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.08 WARRANTY

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.09 MAINTENANCE AND SERVICE

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 3 Months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs, or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components shall not be required, including Sheaves, Rails, Belts, Ropes, Car and CWT guides, etc.

C. The elevator control system must:
   1. Provide in the controller the necessary devices to run the elevator on inspection operation.
   2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
   3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
   4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
   5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
   6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
   7. (Optional) Provide the means from the controller to reset elevator earthquake operation.

D. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:
   1. Remotely diagnose elevator issues with a remote team of experts
   2. Remotely return an elevator to service
   3. Provide real-time status updates via email
   4. Remotely make changes to selected elevator functions including:
      a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak/down peak mode and activate independent service.
      b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s).

c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: Design based upon Otis Elevator's Gen3™ machine room-less elevator system.

2.02 DESIGN AND SPECIFICATIONS

A. Provide machine-roomless Gen3™ traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
   1. Controller located entirely inside the hoistway.
   2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
   3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
   4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
   5. LED lighting standard in ceiling lights and elevator fixtures.
   6. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator Company

2.03 EQUIPMENT: CONTROLLER COMPONENTS

A. Controller: A microcomputer-based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
   1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
   2. Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
   3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
   4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
   5. Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.
   6. A separate control room, space or closet is an option.

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: The governor shall be a tension type car-mounted governor.

C. Buffers, Car, and Counterweight: Polyurethane type buffers shall be used for speeds of 150 and 200 feet per minute. Oil buffers shall be used for a speed of 350 feet per minute.

D. Hoistway Operating Devices:
   1. Emergency stop switch in the pit.
   2. Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.

H. Governor Rope: Shall be steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

J. Hoistway Entrances:
   1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
   2. Sills shall be extruded: Aluminum
   3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
   4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour
   5. Entrance Finish: Satin Stainless Steel
   6. Entrance Marking Plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
   7. Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.

2.05 EQUIPMENT: CAR COMPONENTS

A. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

B. Cab: Steel Shell Cab with raised laminate wall panels
   1. Note: Paints and laminate to be selected from manufacturer’s catalog of choices. Brushed Stainless Steel finished base plate located at top and bottom.
   2. Brushed Stainless Steel finished vertical trim pieces are optional.
   3. Note: Laminate to be selected from manufacturer’s catalog of choices. Brushed Stainless Steel finished base plate located at top and bottom.

C. Car Front Finish: Satin Stainless Steel.

D. Car Door Finish: Satin Stainless Steel.

E. Ceiling Type: Dropped ceiling with LED lights

F. Ceiling Finish: Brushed Steel Finish

G. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

H. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

I. Handrails: Brushed steel finish, 3/8” x 2” flat tubular bar handrails shall be provided on the side walls.

J. Threshold: Aluminum

K. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

L. Guides: The car shall have 3” diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom. Optional counterweight guides available.

M. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

N. The LED ceiling lights, and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.
   1. Note: Below are optional.

O. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

P. Otis cab UVC light purification device

Q. Otis cab air purifier

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A luxury swing luxury swing car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish. (An optional Luxury Swing COP is available. A second COP is available)
   1. The car operating panel shall contain a bank of round stainless steel, mechanical LED illuminated buttons, flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:
   2. The car operating panel shall be equipped with the following features:
      a. Raised markings and Braille to the left-hand side of each push-button.
      b. Car Position Indicator at the top of and integral to the car operating panel.
      c. Door open and door close buttons.
      d. Inspection key-switch.
      e. Elevator Data Plate marked with elevator capacity and car number.
      f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
      g. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
      h. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
   3. Note: Below are Standard for USA and optional in Canada.
      a. In car stop switch (toggle or key unless local code prohibits use)
      b. Firefighter’s hat (standard USA)
      c. Firefighter’s Phase II Key-switch (standard USA)
      d. Call Cancel Button (standard USA)
         1) Note: Below are optional.
      e. Firefighter’s Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.
      f. Please Exit Symbol: provided with emergency hospital service, or express priority in the hall.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation.
   1. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance frame face. Buttons shall be in vertically mounted fixture. Fixture shall be satin stainless steel finish.

2. Button: Flat flush mounted, satin stainless steel button with blue or white LED illuminating halo
3. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound.

D. Access key-switch at top floor in entrance jamb.

E. Access key-switch at lowest floor in entrance jamb.

F. Card Reader Provision is Optional

PART 3 EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

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 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Mechanical couplings.

D. Pipe hangers and supports.

1.03 RELATED REQUIREMENTS

A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.04 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.

B. NFPA 3 - Recommended Practice for Commissioning of Fire Protection and Life Safety Systems; 2015.

C. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing; 2015.

D. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System:
   1. Comply with NFPA 13.
   2. See Section 21 1300.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 through 8 inch: Carbon steel, adjustable swivel, split ring. Tolco 200 or approved equal.

B. Multiple or Trapeze Hangers: Steel channels or pipe with welded spacers and hanger rods.
   1. Rings used as support shall be Heavy Duty and capable of supporting the total load of the pipe being supported. Tolco 200H or approved equal.

C. Wall support: Welded knee-brace and U-Bolt or strut and clamp. Tolco Figure 31-M or A-12 TolStrut with 2STR Strap.

D. Vertical Support: Steel riser clamp. Tolco Figure 6 or approved equal.

E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   2. Place hangers within 12 inches of each horizontal elbow.
   3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

K. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Attach plates at the underside only of suspended ceilings.
   4. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

M. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 0548

VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

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 SECTION INCLUDES

A. Seismic restraints for Fire Protection piping, components, and equipment.

B. For equipment and situations not addressed in this section, Section 230548 takes precedence.

1.03 RELATED REQUIREMENTS

A. Section 01 4533 - Special Inspections.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 21 05 00 Common Work Results for Fire Suppression

1.04 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.05 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

E. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2018.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

H. FM 1950 - Seismic Sway Braces for Automatic Sprinkler Systems; 2010.

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

J. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).

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

L. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

N. FM DS 2-8

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
    a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
    b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.07 PERFORMANCE REQUIREMENTS

A. Seismic Restraint Loading:
1. Site Class as defined in the ICC (IBC).
2. Occupancy Category as defined in the ICC (IBC).
3. Seismic Design Category as defined in the ICC (IBC).
4. Design Spectral Response Acceleration at Short Periods (0.2 Second).
5. Least radius of gyration for rigid bracing shall not be less than l/r=200.
6. See drawings for seismic design criteria.

1.08 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
1. Seismic Controls: Include seismic load capacities.

C. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify mounting conditions required for equipment seismic qualification.
3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements as evaluated by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
4. Indicate proposed arrangement of distributed system trapeze support groupings.
5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.
7. Include point load drawings indicating design loads transmitted to structure at each attachment location.

D. Seismic Design Data:
1. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required to design appropriate seismic controls.
2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

E. Certification for seismically qualified equipment; identify basis for certification.

F. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Evidence of qualifications for seismic controls designer.

I. Evidence of qualifications for manufacturer.

J. Manufacturer’s detailed field testing and inspection procedures.

K. Field quality control test reports.

1.09 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located or NICET Level III and with minimum five years experience designing seismic restraints for nonstructural components.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

F. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: Obtain from project Structural Engineer of Record.

C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Qualification of Equipment:
   1. Provide special certification for fire suppression equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
   2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
   3. Notify Architect Engineer and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
   4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:

1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions, All Seismic Design Categories:
    a. Fire Suppression Piping Exemptions, All Seismic Design Categories:
        1) Lateral sway bracing for piping individually supported within 6 inches of the structure measured between the top of pipe and the point of attachment to the structure, where all conditions for exception specified in NFPA 13 are met.
        2) Lateral sway bracing for branch lines smaller than 2-1/2 inches in diameter, where branch line restraint is provided in accordance with NFPA 13.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    a. ASHRAE (HVACA).
    b. FEMA 412.
    c. FEMA 413.
    d. FEMA 414.
    e. FEMA E-74.
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Restraint Systems:
    a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
    b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
    c. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
    d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
    e. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
    f. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:
1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads) except where listed for such use. Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
7. Concrete Housekeeping Pads:

a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following, as appropriate:
a. Seismic Restraint Systems:
1) Eaton Corporation; TOLCO: www.eaton.com.
2) AFCON: www.afcon.org
3) Substitutions: See Section 01 6000 - Product Requirements.
2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

D. Rigid Restraints: Use steel pipe for structural element; suitable for both compressive and tensile design loads.
1. Material: Schedule 40 pipe or other calcualted rigid bracing element.

E. General Requirements for Restraint Components:
1. Products to be listed in accordance with the requirements of NFPA 13.
2. Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to the Authority Having Jurisdication.
a. Structural Safety Factor: Allowable strength in tension, shear, and pullout forceof components shall be at least four times the maximum seismic forces to which they will be subjected. Follow manufacturer's maximum design loads reduced as appropriate.
3. Size: Based on the lesser of bracing element capacity or anchor load taking into account brace geometry.
4. Mechanical Anchor Bolts: Drilled-in, stud-wedge, or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M. Minimum length of eight times diameter.

5. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect Engineer in accordance with Section 01 4533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
   2. Verification of required clearances between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Comply with the requirements of NFPA 13.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Seismic Controls:
   1. Comply with the requirements of ASCE 7, FEMA E-74, NFPA 13, and applicable local building codes.
   2. Seismic Restraint Systems:
      a. Provide seismic bracing.
      b. Provide end of line restraint.

c. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
d. Install restraints within permissible angles in accordance with seismic design.
e. When used, install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

D. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.05 ATTACHMENTS

A. Statement of special inspections.

END OF SECTION

SECTION 21 0553

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

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 SECTION INCLUDES

A. Nameplates.

B. Pipe markers.

C. Ceiling tacks.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Control Panels: Nameplates.

B. Instrumentation: Nameplates.

C. Major Control Components: Nameplates.

D. Piping: Pipe markers.

E. Pumps: Nameplates.

F. Small-sized Equipment: Nameplates.

G. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

2.02 NAMEPLATES

A. Manufacturers:
   1. Brimar Industries, Inc.: www.pipemarker.com.
   2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Red.
   4. Thickness: 1/16 inch.
   5. Plastic: Comply with ASTM D709.

C. Metal rectangular nameplates to be used valves. Indicate "NORMALLY OPEN" or "NORMALLY CLOSED" on all valves.

2.03 PIPE MARKERS

A. Manufacturers:
   1. Brimar Industries, Inc.; F3 R/W, 28038, or 1F1 R/W: www.pipemarker.com.
   2. Kolbi Pipe Marker Co.; Model Adhesive Style B, C, or D: www.kolbipipemarkers.com.
   3. Craftmark.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

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.
   1. Underground tape to be detectable-type and run continously and be electrically continuous from an accessible location to another accessible location to facilitate detection.

F. Lettering to be "FIRE PROTECTION WATER' or submit other text as appropriate.

G. Color code as follows:
   1. Fire Quenching Fluids: Red with white letters.

2.04 CEILING TACKS

A. Manufacturers:
   1. Craftmark Pipe Markers; Ceiling Valve Marker: www.craftmarkid.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Adhesive vinyl with 3/4 inch diameter color coded head.

C. Color code as follows:
   1. Sprinkler Valves: Red.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install valve nameplates with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe. Underground tape to be detectable-type and run continously and be electrically continuous from an accessible location to another accessible location to facilitate detection.

F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in intersection of grid closest to equipment.

END OF SECTION

SECTION 21 1100

FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe.

B. Valves.

C. Private fire hydrants.

D. Bedding and cover materials.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 21 0500 - Common Work Results for Fire Suppression.

C. Section 21 1300 - Fire-Suppression Sprinkler Systems.

D. Section 31 2316 - Excavation.

E. Section 31 2000 - Earth Moving

F. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.

B. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.

C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021b.

D. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings; 2016.

E. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

F. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

G. AWWA C206 - Field Welding of Steel Water Pipe; 2017.

H. AWWA C502 - Dry-Barrel Fire Hydrants; 2018.

I. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; 2017.

J. FM (AG) - FM Approval Guide; current edition.

K. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturer's catalog information.
   3. Indicate valve data and ratings.
   4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Test Reports: Factory certified tests to verify that short-term rupture strength for RTRP I (filament bound) jointing is 1,500 psi or greater.

F. Field Quality Control Submittals: Testing activities.

G. Project Record Documents:
   1. Record actual locations of piping mains, valves, connections, fire hydrants, free-standing fire department connections, underground manholes and vaults, valve boxes, thrust restraints, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

H. Maintenance Data: Include installation instructions, spare parts lists, and exploded assembly views.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

E. Provide grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

F. Date stamp castings used for coupling housings, fittings, and valve bodies for quality assurance and traceability.

G. Coupling Manufacturer:
   1. Perform on-site training by factory-trained representative to Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.

H. Welder Qualifications:
   1. Certify in accordance with ASME BPVC-IX.
   2. Provide certificate of compliance from local Authority Having Jurisdiction, indicating approval of welders.

I. Valves: Bearing product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

J. Products:
   1. Listed, classified, and labeled as suitable for the purpose specified and indicated.

K. Perform Work in accordance with local authorities having jurisdiction, municipality, and water utility requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Ductile Iron Pipe: Listed, AWWA C104/A21.4:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with rods.
   3. Jackets: AWWA C105/A21.5 polyethylene jacket.

2.02 PRIVATE FIRE HYDRANTS

A. Dry-Barrel:
   1. Manufacturers:
      a. American AVK Company; _____: www.americanavk.com/#sle.
      b. Kennedy Valve Company; _____: www.kennedyvalve.com/#sle.
      c. Mueller Company, LLC; _____: www.muellercompany.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Construction:
      a. UL (DIR) listed and AWWA C502 compliant.
      b. Rated Working Pressure: 250 psi.
      c. Compression type, opening against system pressure and closing with system pressure.
      d. Traffic breakaway type.
   3. Hydrant Cap and Stuffing Box: One piece design with water-tight cavity, sealed from contact with water.
   4. Operating Nut: One-piece, bronze construction with protective weather seal or shield.
   5. Nozzles: Tamper resistant, 1/4 turn type with O-ring seals including retaining/locking screws or other suitable nozzle lock to prevent inadvertent removal.
   6. Main Valve: Provide reinforced, synthetic rubber or completely encapsulated with EPDM.
   7. Seat: Provide O-rings to seal drain-way and barrel from water leakage into shoe.
   8. Drains to momentarily flush outward when opened to remove debris and complete draining upon closing of the main valve.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.

B. Cover: As specified in Section 31 2316.

2.04 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 3000.

B. Tracer Wire:
   1. Provide magnetic, detectable conductor with clear plastic covering and imprinted with "Water Service" in large letters.
   2. Conductor to be of sufficient length to be continuous over each separate run of nonmetallic pipe.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. Earthwork: Perform earthwork operations in accordance with Sections 31 2316 and 31 2000.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide 25 sq feet thrust restraint bearing on subsoil.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION

A. General Requirements:
   1. Location of Water Lines:
      a. Do not install water line closer horizontally than 10 feet from any sewer line unless indicated otherwise.
   2. Sleeving:
      a. Sleeve water piping where piping is required to be installed within 3 feet of existing structures.
      b. Provide ductile iron or Schedule 40 steel sleeves.
      c. Fill annular space between pipe and sleeves with mastic.
      d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.
   3. Pipe Laying and Jointing:
      a. Remove fins and burrs from pipe and fittings.
      b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
      c. Provide proper facilities for lowering pipe sections into trenches.
      d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
      e. Cut pipe in a neat, workmanlike manner accurately to length established at the site and work into place without forcing or springing.
      f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
      g. Wedging or blocking between bells and spigots will not be permitted.
      h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
      i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
      j. Support piping at proper elevation and grade.
      k. Secure firm, uniform support.
      l. Wood support blocking will not be permitted.
      m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
      n. Provide anchors and supports where indicated and necessary for fastening work into place.
      o. Provide proper provisions for expansion and contraction of pipelines.
      p. Keep trenches free of water until joints have been properly made.
      q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each workday.
      r. Do not install pipe during unacceptable trench conditions or inclement weather.

s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet.

4. Connections to Existing Water Lines:
   a. Ensure minimal interruption of service on the existing line.
   b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.
5. Penetrations:
   a. Provide ductile-iron or Schedule 40 steel for pipes passing through walls of valve pits and structures.
   b. Fill annular space between sleeves and walls with rich cement mortar.
   c. Fill annular space between pipe and sleeves with mastic.

B. Special Requirements:
1. Ductile Iron Piping:
   a. Unless otherwise specified, install pipe and fittings in accordance with paragraph "General Requirements".
   b. Jointing:
      1) Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11.
      2) Make grooved and shouldered type joints with the couplings previously specified for this type joint connecting pipe with the grooved or shouldered ends specified for this type joint; assemble in accordance with the recommendations of the coupling manufacturer.
         (a) Groove pipe in the field only with approved grooved cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings; secure approval for field-cut grooves before assembling the joint.
   c. Allowable Deflection:
      1) Maximum Allowable Deflection: As stated in AWWA C600.
      2) If the alignment requires deflection in excess of the above limitations, furnish special blends or a sufficient number of shorter pipe lengths to provide angular deflections within the limit set forth.
   d. Pipe Anchorage:
      1) Provide concrete thrust blocks (reaction backing), for pipe anchorage except where metal harness is indicated.
      2) Thrust blocks to comply with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks to be as indicated.
      3) Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
      4) Provide metal harness in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps as indicated in NFPA 13, except as otherwise indicated.
   e. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.

C. Fire Hydrants:
1. Install in accordance with NFPA 13, the Local Authority Having Jurisdiction, and the local water utility.
2. Set fire hydrant plumb and brace at grades and locations in upright position and as indicated.

a. Where hydrant barrel passes through concrete slab, position 1 inch thick piece of standard sidewalk expansion joint material around section of barrel passing through concrete.

3. Place 12 inch by 12 inch yellow indicators, plywood, sheet metal, plastic, or other material approved by the Project Manager, on pumper nozzles of relocated or new fire hydrants installed on new fire water lines not in service.
   a. Remove indicators after new fire water line is tested and approved by the Architect Engineer.
4. Provide thrust blocks on all hydrant tees.
   a. Provide thrust block behind hydrant shoe if hydrant lateral is not restrained.
   b. Avoid covering drain ports, bolts, or fittings when placing concrete thrust block.
5. Install each fire hydrant with separate gate valve in supply pipe.
6. Installation of hydrants requiring changes in bury depth due to unforeseen obstructions requires the approval of the Architect Engineer in writing prior to installation.
7. Coating Requirements:
   a. Provide a color chip code sample in accordance with applicable NFPA standards for the hydrant bonnet indicating available flow at 20 psi according to the following:
      1) Supply Water Line Flow Characteristics/Bonnet Color:
         (a) Less than 500 gpm: Red.
         (b) 500 gpm - 999 gpm: Orange.
         (c) 1500 gpm and Greater: Light Blue.
8. Remove and dispose of unsuitable materials and debris in accordance with local or state requirements.

3.05 SERVICE CONNECTIONS

A. Provide fire water service to Local Authority Having Jurisdiction requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.

3.06 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
   1. See Section 01 4000 - Quality Requirements for additional requirements.
   2. Provide all labor, equipment, and incidentals required for field testing, except that water and electric power needed for field tests will be furnished as set forth in Section 01 5100 - Temporary Utilities.
   3. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete.
   4. Fill pipeline 24 hours before testing and apply test pressure to stabilize system, using only potable water.
   5. Test water piping in accordance with NFPA 13, where the additional water added to the system must not exceed the limits given in NFPA 13.
   6. Pressure test piping to 200 psi.
   7. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
   8. Prepare reports of testing activities.

3.07 CLEANING

A. Upon completion of the installation of water lines and appurtenances, remove and haul away all surplus material, including debris resulting from the work.

3.08 CLOSEOUT ACTIVITIES

A. See Section 52 - 52 for closeout submittals.

B. See Section 3326 - 3326 for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.

2. Conduct walking tour of project.
3. Briefly describe function, operation, and maintenance of each component.

E. Training: Train Owner's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 21 1300

FIRE-SUPPRESSION SPRINKLER SYSTEMS

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 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

D. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

F. Section 28 4600 - Fire Detection and Alarm.

1.04 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.

F. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL (DIR) - Online Certifications Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect Engineer.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Designer's qualification statement.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

J. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Comply with FM (AG) requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer.

F. Equipment and Components: Provide products that bear FM (AG) label or marking.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building control system.

E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   6. Other Types: As required.

2.02 SPRINKLERS

A. Exposed Area Type: Pendant type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Flexible Drop System: Stainless steel, multiple use, open gate type.

1. Application: Use to properly locate sprinkler heads.
2. Include all supports and bracing.
3. Provide braided type tube as required for the application.
4. Manufacturers:
    a. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

F. Flush entire piping system of foreign matter.

G. Hydrostatically test entire system.

H. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 0510

BASIC PLUMBING REQUIREMENTS

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 PROJECT MANAGEMENT

A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.

B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

1.03 CODES, ORDINANCES, INSPECTIONS, AND PERMITS

A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.

B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.

C. All plumbing work shall comply with latest local codes and the the State in which the Project is located plumbing code.

D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

1.04 COORDINATION

A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.

B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

1.05 SUBMITTALS

A. Comply with Division 01.

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for plumbing fixtures, plumbing specialties, plumbing equipment, and others as may be requested.

C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

1.06 SUBSTITUTIONS

A. Comply with Division 01.

B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged

connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.

C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

1.07 CLEAN UP

A. Comply with Division 01.

B. Do not allow waste material or rubbish to accumulate in or about job site.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

1.08 EQUIPMENT START-UP AND SYSTEM COORDINATION

A. Comply with Division 01.

B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

1.09 CUTTING AND PATCHING

A. Comply with Division 01.

B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

1.10 RECORD DOCUMENTS

A. Comply with Division 01.

1.11 OPERATION INSTRUCTIONS

A. Comply with Division 01.

B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

1.12 FLASHINGS

A. Refer to Division 07 for roof flashings.

1.13 ACCESS PANELS

A. Comply with Section 08 3100 - Access Doors.

B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

1.14 PAINT EXTERIOR PIPING

A. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.

B. Natural gas piping shall be painted yellow.

1.15 DOMESTIC WATER PIPING

A. Valve, strainer and other domestic water piping specialties shall be bronze, brass, stainless steel or epoxy coated cast iron only for the services that are in contact with domestic water.

B. No cast iron valves, strainers or any other accessories that contact domestic water are allowed without epoxy coating.

1.16 LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were

obtained from surveys and/or local utility companies and are not to be assumed as being accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

1.17 GUARANTY-WARRANTY

A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

1.18 EQUIPMENT CONNECTIONS

A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
   1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
   2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.

1.19 ELECTRICAL

A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

B. Supervise and coordinate all electrical work in connection with mechanical system.

1.20 MOTOR CONTROLLERS

A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.

B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.

C. Provide magnetic starters and with overload protection for single phase motors larger than 1/2 horsepower and all 3 phase motors. Starters for 3-phase motors shall have 3-pole overload protection. All starters shall have pilot lights. Starters being controlled by other devices shall have "hand"-"off"-"auto" switches. Starters being controlled locally shall have push button stations mounted on starter or remote. Provide auxiliary contacts as required. Provide manual starter with overload on all motors 1/2 HP or less that are not inherently protected, and if required for remote control, a magnetic contactor.

D. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

E. Provide variable frequency drive controllers on all pump motors that are three phase powered regardless if they serve a constant flow or variable flow system.

F. Provide a motor mounterd potentiometer dial on all pump motors that are electronic commutation (EC) motors.

G. Provide variable speed solid state controllers on all pump motors that are single phase powered and are not electronic commutation (EC) motors.

H. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

1.21 EXCAVATION, TRENCHING, AND BACKFILLING

A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.

B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.

C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.

F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.

G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

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 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary Sewer.
   2. Domestic Water.
   3. Storm Water.
   4. Condensate Waste.
   5. Flanges, Unions, and Couplings.
   6. Pipe Hangers and Supports.
   7. Ball valves.
   8. Valves.
   9. Check.
   10. Relief valves.
   11. Strainers.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2016.

E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV; 2017.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).

H. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

J. ASTM B32 - Standard Specification for Solder Metal; 2020.

K. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

N. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

O. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

P. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

Q. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

R. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

S. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2021.

T. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

U. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

V. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.

W. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

Y. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

Z. ASTM E84 - Standard Specification for "Standard Test Method for Surface Burning Characteristics of Building Materials" - (Flame Spread/Smoke Development).

AA. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

AB. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

AC. AWWA C606 - Grooved and Shouldered Joints; 2015.

AD. AWWA C651 - Disinfecting Water Mains; 2014.

AE. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).

AF. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2012 (Revised 2018).

AG. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.

AH. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.

AI. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

AJ. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.

AK. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

AL. MSS SP-67 - Butterfly Valves; 2017.

AM. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

AN. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

AO. NSF 61 - Drinking Water System Components - Health Effects; 2020.

AP. NSF 372 - Drinking Water System Components - Lead Content; 2020.

AQ. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2665. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B88, hard drawn, Type K.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8, BCuP copper/silver braze.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

2.06 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.07 STORM WATER PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.08 CONDENSATE WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

C. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 CONDENSATE WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

C. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40 Solid Core
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.10 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.11 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
   6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High density polypropylene.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
      e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   4. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
   4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   5. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
   6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   7. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
   8. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.12 GATE VALVES

A. Up To and Including 2 inch (50 mm).
   1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

B. 2-1/2 inches (50 mm) and larger:
   1. MSS SP-70, Class 125, iron body, with epoxy coated interior, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide gear-type operator on valves 4" and larger. Provide chain-gear operators for valves mounted over 8 feet (2400 mm) above floor.

2.13 GLOBE VALVES

A. Up To and Including 2 inch (50 mm).
   1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

B. 2-1/2 inches (50 mm) and larger:
   1. MSS SP-85, Class 125, iron body, with epoxy coated interior, outside screw and yoke, handwheel, renewable bronze plug-type disc, renewable seat, flanged ends. Provide gear-type operator on valves 4" and larger. Provide chain-gear operators for valves mounted over 8 feet (2400 mm) above floor.

2.14 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union. Ductile iron valves shall have epoxy coated interiors.

2.15 BUTTERFLY VALVES

A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.16 SWING CHECK VALVES

A. Over 2 Inches:
   1. MSS SP-71, Class 125, iron body, with epoxy coated interior, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.17 SPRING LOADED CHECK VALVES

A. Class 125, iron body, with epoxy coated interior, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.18 RELIEF VALVES

A. Pressure:
   1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure:
   1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

2.19 STRAINERS

A. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, epoxy coated, Y pattern with 1/16 inch stainless steel perforated screen.

B. Size 5 inch and Larger:
   1. Class 125, flanged iron body, epoxy coated, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

I. Provide support for utility meters in accordance with requirements of utility companies.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
   1. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.
   2. Natural gas piping shall be painted yellow.

K. Install bell and spigot pipe with bell end upstream.

L. Install water piping to ASME B31.9.

M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

O. Sleeve pipes passing through partitions, walls and floors.

P. PVC Pipe shall not be installed in air plenums in accordance with ASTM E84

Q. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

R. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor or per manufacturer's instructions. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 0548.
11. Support cast iron drainage piping at every joint.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

G. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
   2. Provide 18 gage, 0.0478 inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

3.08 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches to 1-1/4 inches:
         1) Maximum Hanger Spacing: 6.5 ft.
         2) Hanger Rod Diameter: 3/8 inches.
      b. Pipe Size: 1-1/2 inches to 2 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 3/8 inch.
      c. Pipe Size: 2-1/2 inches to 3 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 1/2 inch.
      d. Pipe Size: 4 inches to 6 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 5/8 inch.
      e. Pipe Size: 8 inches to 12 inches:
         1) Maximum hanger spacing: 14 ft.
         2) Hanger Rod Diameter: 7/8 inch.
      f. Pipe Size: 14 inches and Over:
         1) Maximum Hanger Spacing: 20 ft.
         2) Hanger Rod Diameter: 1 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft.
            (a) Provide metal saddles at each hanger, min 24" in length.
         2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 22 3000
PLUMBING EQUIPMENT

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 SECTION INCLUDES

A. Sump pumps.

1.03 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

C. NSF 61 - Drinking Water System Components - Health Effects; 2012.

D. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D. Manufacturer's Instructions: Indicate clearances and connection requirements.

E. Project Record Documents: Record actual locations of components.

F. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 SUMP PUMPS (SEE PLUMBING SCHEDULES)

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.

C. Pumps:

1. Ensure shaft length allows sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.
2. 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.

END OF SECTION

SECTION 23 0510
BASIC HVAC REQUIREMENTS

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 PROJECT MANAGEMENT

A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.

B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

1.03 CODES, ORDINANCES, INSPECTIONS, AND PERMITS

A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.

B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.

C. All plumbing work shall comply with latest local codes and the the State in which the Project is located plumbing code.

D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

1.04 COORDINATION

A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.

B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

1.05 SUBMITTALS

A. Comply with Division 01.

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for HVAC equipment, HVAC piping specialties, air distribution devices and others as may be requested.

C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

1.06 SUBSTITUTIONS

A. Comply with Division 01.

B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged

connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.

C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

1.07 CLEAN UP

A. Comply with Division 01.

B. Do not allow waste material or rubbish to accumulate in or about job site.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

1.08 EQUIPMENT START-UP AND SYSTEM COORDINATION

A. Comply with Division 01.

B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

1.09 CUTTING AND PATCHING

A. Comply with Division 01.

B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

1.10 RECORD DOCUMENTS

A. Comply with Division 01.

1.11 OPERATION INSTRUCTIONS

A. Comply with Division 01.

B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

1.12 FLASHINGS

A. Refer to Division 07 for roof flashings.

1.13 ACCESS PANELS

A. Comply with Section 08 3100 - Access Doors and Panels.

B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

1.14 LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are not to be assumed as being accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

1.15 GUARANTY-WARRANTY

A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

1.16 EQUIPMENT CONNECTIONS AND INSTALLATION

A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
   1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
   2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.

D. Unless another form of vibration isolation is used, all equipment shall be mounted at least on neoprene pads.

1.17 ELECTRICAL

A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

B. Provide electrical disconnects for all mechanical equipment as per NEC.

C. Supervise and coordinate all electrical work in connection with mechanical system.

1.18 MOTOR CONTROLLERS

A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.

B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.

C. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

1.19 EQUIPMENT FEATURES

A. All belt driven fans shall include an automatice belt tensioner to maintain belt tension after start-up.

1.20 EXCAVATION, TRENCHING, AND BACKFILLING

A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.

B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.

C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.

F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.

G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

1.21 SEISMIC QUALIFICATION OF EQUIPMENT

A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualifications.
   1. Air handling equipment

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Single phase electric motors.

C. Three phase electric motors.

1.02 RELATED REQUIREMENTS

A. Section 26 2913 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.

C. NEMA MG 1 - Motors and Generators; 2018.

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

1.04 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

C. Operation Data: Include instructions for safe operating procedures.

D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.03 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.04 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26 2913.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0517

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

A. Section 23 0719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. FM (AG) - FM Approval Guide; current edition.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
1. Galvanized steel pipe or black iron pipe with asphalt coating.
2. Connect sleeve with floor plate except in mechanical rooms.

E. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening, 20 psi.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
a. Corrosion resistant.
b. Oil, fuel, gas, and solvent resistant.
c. Underground, buried, and wet conditions.
d. High Temperature, up to 400 degrees F.
e. Low temperature, down to minus 67 degrees F.
5. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.
2. Combined packing and seal compound is to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

E. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch thick.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
a. Pack solid using mineral fiber in compliance with ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

E. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 23 0519

METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

C. Static pressure gauges.

D. Filter gauges.

1.02 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi; 2004 (Reaffirmed 2017).

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi.

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.03 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.04 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

2.05 STATIC PRESSURE GAUGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

D. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

E. Coil and conceal excess capillary on remote element instruments.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

I. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 23 0523

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Butterfly valves.

C. Check valves.

D. Gate valves.

1.02 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels.

B. Section 23 0553 - Identification for HVAC Piping and Equipment.

C. Section 23 0719 - HVAC Piping Insulation.

D. Section 23 2113 - Hydronic Piping.

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding; 2017.

B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.

F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

G. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

H. ASME B31.9 - Building Services Piping; 2020.

I. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.

J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).

K. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2018).

L. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.

M. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

N. AWWA C606 - Grooved and Shouldered Joints; 2015.

O. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).

P. MSS SP-67 - Butterfly Valves; 2017.

Q. MSS SP-68 - High Pressure Butterfly Valves with Offset Design; 2017.

R. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.

S. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

T. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

U. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

V. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.
   6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Handle large valves with sling, modified to avoid damage to exposed parts.
   2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly, Ball, and Globe.

2. Isolation (Shutoff): Butterfly, Gate, and Ball.
3. Swing Check (Pump Outlet):
    a. 2 NPS and Smaller: Bronze with bronze disc.
    b. 2-1/2 NPS and Larger: Iron with lever and spring or center-guided with resilient seat.
4. Dead-End: Butterfly, single-flange (lug) type.

C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

D. Required Valve End Connections for Non-Wafer Types:
1. Steel Pipe:
    a. 2 NPS and Smaller: Threaded ends.
    b. 2-1/2 NPS and Larger: Grooved ends.
2. Copper Tube:
    a. 2 NPS and Smaller: Threaded ends (Exception: Solder-joint valve-ends).
    b. 2-1/2 NPS and Larger: Grooved ends.

E. Chilled Water Valves:
1. 2 NPS and Smaller, Brass and Bronze Valves:
    a. Threaded ends.
    b. Ball: Full port, one piece, brass trim.
    c. Swing Check: Bronze disc, Class.
    d. Gate: NRS, Class 125.
2. 2-1/2 NPS and Larger, Iron Valves:
    a. 2-1/2 NPS to 4 NPS: Threaded ends.
    b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
    c. Single-Flange Butterfly: 2-1/2 NPS to 12 NPS, aluminum-bronze disc, EPDM seat, 200 CWP.
    d. Single-Flange Butterfly: 14 NPS to 24 NPS, aluminum-bronze disc, EPDM seat, 150 CWP.
    e. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 175 CWP.
    f. Butterfly: High performance, single flange, Class 150.
    g. Swing Check: Metal seats, Class 125.
    h. Swing Check with Closure Control: 2-1/2 NPS to 12 NPS, lever and spring, Class 125.
    i. Grooved-End Check: 3 NPS to 12 NPS, 300 CWP.
    j. Center-Guided Check: Compact-wafer, resilient seat, Class 125.
    k. Plate-Type Check: Single plate, resilient seat, Class 125.
    l. Gate: NRS, Class 125.

F. Heating Hot Water Valves:
1. 2 NPS and Smaller, Brass and Bronze Valves:
    a. Threaded ends.
    b. Angle: Bronze disc, Class 125.
    c. Ball: Full port, one piece, brass trim.
    d. Swing Check: Bronze disc, Class 125.
    e. Gate: NRS, Class 125.
2. 2-1/2 NPS and Larger, Iron Valves:
    a. 2-1/2 NPS to 4 NPS: Threaded ends.
    b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
    c. Single-Flange Butterfly: 2-1/2 NPS to 12 NPS, aluminum-bronze disc, EPDM seat, 200 CWP.
    d. Single-Flange Butterfly: 14 NPS to 24 NPS, aluminum-bronze disc, EPDM seat, 150 CWP.
    e. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 175 CWP.
    f. Butterfly: High performance, single flange, Class 150.
    g. Swing Check: Metal seats, Class 125.

h. Swing Check: 2-1/2 NPS to 12 NPS, lever and spring closure control, Class 125.
i. Grooved-End Swing Check: 3 NPS to 12 NPS, 300 CWP.
j. Center-Guided Check: Compact-wafer, resilient seat, Class 125.
k. Plate-Type Check: Single plate, resilient seat, Class 125 .
l. Gate: NRS, Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Gear Actuator: Quarter-turn valves 8 NPS and larger.
2. Handwheel: Valves other than quarter-turn types.
3. Hand Lever: Quarter-turn valves 6 NPS and smaller except plug valves.

D. Valves in Insulated Piping: Provide 2 NPS stem extensions and the following features:
1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: Extended neck.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

G. General ASME Compliance:
1. Building Services Piping Valves: ASME B31.9.

H. Bronze Valves:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRASS BALL VALVES

A. One Piece, Reduced Port with Brass Trim:
1. Comply with MSS SP-110.
2. CWP Rating: 400 psig.
3. Body: Forged brass.
4. Ends: Threaded.
5. Seats: PTFE or TFE.
6. Stem: Brass.
7. Ball: Chrome-plated brass.
8. Operator: Handle.

B. Two Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body: Forged brass.
5. Seats: PTFE or TFE.
6. Stem: Stainless Steel.

7. Ball: Chrome-plated brass.
8. Cap: Include cap-gasket and chain for 3/4 inch hose connection.
9. Operator: Lockable handle and memory stop.

C. Two Piece, Full Port with Press Connection:
1. CWP Rating: 250 psig, WOG.
2. Body: Forged brass.
3. Seats: EPDM.
4. Ball: Chrome-plated brass.
5. Blow-out Proof Stem: Forged brass.
6. Operator: Provide memory stop.
7. Maximum Service Temperature: 250 deg F.

2.04 BRONZE BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:
1. Comply with MSS SP-110.
2. CWP Rating: 400 psig.
3. Ends: Threaded.
4. Seats: PTFE.
5. Stem: Bronze.
6. Ball: Chrome plated brass.

C. Two Piece, Standard Port and Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body: Bronze.
5. Ends: Threaded.
6. Seats: PTFE .
7. Stem: Bronze or brass.
8. Ball: Chrome plated brass.
9. Operator: Provide memory stop.

2.05 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead end service without downstream flange.
1. Comply with MSS SP-67, Type I.
2. CWP Rating: 150 psig, and 200 psig.
3. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
4. Stem: One or two-piece stainless steel.
5. Seat: NBR.

2.06 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psi.
1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.

B. CWP Rating: 175 psig (1200 kPa), 300 psig (2070 kPa): 8 NPS (50 DN) or smaller, and 200 psig (1389 kPa): 10 NPS (250 DN) or larger.
1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Stainless steel.

4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.

2.07 HIGH-PERFORMANCE SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead end service without downstream flange.
1. Comply with MSS SP-68.
2. Class 150: CWP Rating: 285 psig, and Class 300: CWP Rating: 720 psig at 100 degrees F.
3. Body: Provide carbon steel, cast iron, ductile Iron, or stainless steel.
4. Seat: Metal or reinforced PTFE.
5. Offset stem: Stainless steel.
6. Disc: Carbon steel.

2.08 BRONZE GATE VALVES

A. Non-Rising Stem (NRS) or Rising Stem (RS):
1. Comply with MSS SP-80, Type I.
2. Body Material: Bronze with integral seat and union-ring bonnet.
3. Ends: Threaded or solder joint.
4. Stem: Bronze.
5. Disc: Solid wedge; bronze.
6. Packing: Asbestos free.
7. Handwheel: Malleable iron, bronze, or aluminum.

2.09 IRON GATE VALVES

A. NRS or OS & Y:
1. Comply with MSS SP-70, Type I.
2. Body Material: Gray iron with bolted bonnet.
3. Ends: Flanged.
4. Trim: Bronze.
5. Disc: Solid wedge.
6. Packing and Gasket: Asbestos free.

2.10 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to ball and butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
1. Lift Check: Install with stem plumb and vertical.

2. Swing Check: Install horizontal maintaining hinge pin level.
3. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

D. Provide chainwheels on operators for valves 4 NPS and larger where located 96 inches or more above finished floor, terminating 60 inches above finished floor.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014 (Reapproved 2020).

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2018).

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

I. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

K. FM (AG) - FM Approval Guide; current edition.

L. MFMA-4 - Metal Framing Standards Publication; 2004.

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 3.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

C. Fiberglass Channel (Strut) Framing Systems:
   1. Factory-fabricated continuous-slot fiberglass channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Channel Material: Use polyester resin or vinyl ester resin.
   3. Minimum Channel Dimensions: 1-5/8 inch width by 1 inch height.
   4. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.

D. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Piping up to 1 inch: 1/4 inch diameter.
      c. Piping larger than 1 inch: 3/8 inch diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

E. Thermal Insulated Pipe Supports:
   1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch iron pipes.
d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a galvanized steel jacketing.

2. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

F. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F:
a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
b. Support From Below: MSS SP-58 Types 35 through 38.

G. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

H. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

I. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

J. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

K. Insulation Clamps:
1. Two bolt-type clamps designed for installation under insulation.
2. Material: Carbon steel with epoxy copper or zinc finish.

L. Pipe Hangers:
1. Hangers:
a. Provide hinged split ring and yoke roller hanger with plain finish.
b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
c. Provide hanger rod and nuts of the same type and material for a given pipe run.
d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

M. Intermediate Pipe Guides:
   1. Pipe Diameter 6 inch and Smaller: Provide minimum clearance of 0.16 inch.
   2. Pipe Sizes 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.
   3. Pipe Size 10 inch: 0.75 inch U-bolt.
   4. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.
   5. Pipe Sizes 18 to 30 inch: 1 inch U-bolt.
   6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

N. Pipe Alignment Guides: Galvanized steel.
   1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.

O. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

P. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
   1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

Q. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use wood screws.
   9. Plastic and lead anchors are not permitted.
   10. Powder-actuated fasteners are not permitted.
   11. Hammer-driven anchors and fasteners are not permitted.
   12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.
      b. Channel Material: Use galvanized steel.
      c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect Engineer, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect Engineer, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC - MASON

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

D. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

1.03 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. ductwork, piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

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

D. MFMA-4 - Metal Framing Standards Publication; 2004.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and non-essential components in consideration of seismic interaction.
   5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Equipment Isolation: As indicated on drawings.

E. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.
      b. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.
   2. Suspended Piping, Non-Seismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
   3. Suspended Piping, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
   4. Floor-Mounted Piping, Non-Seismic Applications: Use open (unhoused) spring isolators.
   5. Floor-Mounted Piping, Seismic Applications: Use seismic type restrained spring isolators.
   6. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g. walls, floors) arranged to prevent vibration transmission to structure.

2.02 SEISMIC CONTROL REQUIREMENTS

A. Provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Seismic Design Criteria: As indicated on drawings.

C. Seismic Design Criteria: As indicated on drawings..

D. Component Importance Factor (Ip): HVAC components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

E. Seismic Qualification of Equipment:
   1. Provide special certification for HVAC equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
   2. Notify Architect Engineer and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
   3. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

F. Seismic Restraints:
   1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.

2. Seismic Restraint Exemptions:
    a. Duct System Exemptions, All Seismic Design Categories:
        1) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control with component importance factor (Ip) of 1.0, where flexible connections or other assemblies are provided between duct system and associated components, where duct system is positively attached to the structure, and where one of the following apply:
            (a) Trapeze supported duct with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
            (b) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
            (c) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
            (d) Hanger supported duct with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.
        2) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control, where there are provisions to avoid impact with other ducts or mechanical components or to protect ducts in the event of such impact, and where duct system is positively attached to the structure and has a cross sectional area of less than 6 square feet and weighs 20 pounds per foot or less.
    b. HVAC Piping Exemptions, All Seismic Design Categories:
        1) HVAC piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
            (a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
            (b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
            (c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.
            (d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category

exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

(e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third party registered professional engineer acceptable to authorities having jurisdiction.
4. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
5. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
   c. Use only one restraint system type for a given HVAC component or distributed system (e.g. ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
6. Ductwork Applications:
   a. Provide independent support and seismic restraint for in-line components (e.g. fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
   b. Positively attach appurtenances (e.g. dampers, louvers, diffusers) with mechanical fasteners.

G. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners except where permitted by applicable code.

4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads) except where permitted by applicable code. Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
    a. Increase size of pad as required to comply with anchor requirements.
    b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

H. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

I. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
    a. Relative displacements at connections between components, including distributed systems (e.g. ductwork, piping); do not exceed load limits for equipment utility connections.
    b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
    c. Design displacements at seismic separations.
    d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:
1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

B. Vibration-Isolated Concrete Inertia Bases:
1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.

2.04 VIBRATION ISOLATORS

A. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2.05 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use 1 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   3. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of isolation.
   4. Use elastomeric grommets for attachments where required to prevent short circuiting of isolation.
   5. Adjust isolators to be free of isolation short circuits during normal operation.
   6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
   6. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
      b. Install restraints within permissible angles in accordance with seismic design.
      c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
      d. Install cable restraints for vibration-isolated components slightly slack to prevent short circuiting of isolation.
      e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.03 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.04 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Automatic Controls: Tags. Key to control schematic.

C. Dampers: Ceiling tacks, where located above lay-in ceiling.

D. Ductwork: Nameplates.

E. Heat Transfer Equipment: Nameplates.

F. Instrumentation: Tags.

G. Major Control Components: Nameplates.

H. Piping: Tags.

I. Small-sized Equipment: Tags.

J. Thermostats: Nameplates.

K. Valves: Tags and ceiling tacks where located above lay-in ceiling.

L. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:

B. Letter Color: White.

C. Letter Height: 1/2 inch.

D. Background Color: Black.

E. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.05 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 9123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Pipe Marker Placement. Pipe markers should be located as follows:
   1. At intervals of not more than 20 feet
   2. At least once in or above every room
   3. On both sides of walls or partitions penetrated by the piping
   4. At least once in every story height traversed by risers
   5. Adjacent to each valve port and flange end.

G. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

H. Use tags on piping 3/4 inch diameter and smaller.

I. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

J. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Duct Air Leakage Testing

C. Testing, adjustment, and balancing of hydronic and refrigerating systems.

D. Measurement of final operating condition of HVAC systems.

1.03 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Employment of testing agency and payment for services.

1.04 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect Engineer.
   2. Submit to the Commissioning Authority.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect Engineer and other installers to sufficiently understand the design intent for each system.
   5. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Identification and types of measurement instruments to be used and their most recent calibration date.
      d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      e. Final test report forms to be used.
      f. Expected problems and solutions, etc.
      g. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit to the the Construction Manager and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
   2. Revise TAB plan to reflect actual procedures and submit as part of final report.
   3. 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.
   4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   6. Units of Measure: Report data in I-P (inch-pound) units only.
   7. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Engineer.
      g. Project Contractor.
      h. Project altitude.
      i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).
   4. NEBB (TAB)
   5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. 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. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are 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 is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 DUCT AIR LEAKAGE TESTING (DALT)

A. TAB Agency shall perform the leakage test as outlined in "Duct leakage Tests and Repairs" in Section 23 31 00 HVAC DUCTS and CASINGS for TAB agency's role and responsibilities in witnessing, recording and reporting of deficiencies.

3.07 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, at minimum air flow rate, and full heating air flow rate.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.08 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of VFD (where present), balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.09 SCOPE

A. Test, adjust, and balance the following:
   1. Air Coils.
   2. Terminal Heat Transfer Units.
   3. Air Handling Units.
   4. Fans.
   5. Air Filters.
   6. Air Inlets and Outlets.

3.10 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.
   6. Service factor.
   7. Starter size, rating, heater elements.
   8. Sheave Make/Size/Bore.

B. V-Belt Drives:
   1. Identification/location.
   2. Required driven RPM.
   3. Driven sheave, diameter and RPM.
   4. Belt, size and quantity.
   5. Motor sheave diameter and RPM.
   6. Center to center distance, maximum, minimum, and actual.

C. Cooling Coils:
   1. Identification/number.
   2. Location.
   3. Service.
   4. Manufacturer.
   5. Air flow, design and actual.
   6. Entering air DB temperature, design and actual.
   7. Entering air WB temperature, design and actual.
   8. Leaving air DB temperature, design and actual.
   9. Leaving air WB temperature, design and actual.
   10. Water flow, design and actual.
   11. Water pressure drop, design and actual.
   12. Entering water temperature, design and actual.
   13. Leaving water temperature, design and actual.
   14. Saturated suction temperature, design and actual.
   15. Air pressure drop, design and actual.

D. Heating Coils:
   1. Identification/number.
   2. Location.
   3. Service.
   4. Manufacturer.
   5. Air flow, design and actual.
   6. Water flow, design and actual.
   7. Water pressure drop, design and actual.
   8. Entering water temperature, design and actual.
   9. Leaving water temperature, design and actual.

10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

E. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

F. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

G. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

H. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.

8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

I. Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
   a. Blower.
   b. Orifice, tube size.
   c. Orifice size.
   d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

J. Air Monitoring Stations:
1. Identification/location.
2. System.
3. Size.
4. Area.
5. Design velocity.
6. Design air flow.
7. Test velocity.
8. Test air flow.

K. Flow Measuring Stations:
1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.
11. Station calibrated setting.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

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 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9123 - Interior Painting: Painting insulation jackets.

C. Section 23 0553 - Identification for HVAC Piping and Equipment.

D. Section 23 3100 - HVAC Ducts and Casings.

1.04 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

H. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016 (Reapproved 2021).

I. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015 (Reapproved 2021)e1.

M. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 250 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETS

A. Exterior insulation jackets for outside applications shall be a multi-ply embossed UV-resistant aluminum foil/polymer laminate with a layer of rubberized asphalt specially fomulated for use on insulated duct. The jacket willl include a metalized polyester film coated with a high quality low temperature acrylic adhesive that allows for a peel and stick functionality.

B. Aluminum (Indoor) Jacket: ASTM B209 (ASTM B209M).
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
   6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.05 DUCT LINER

A. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
   1. Fungal Resistance: No growth when tested according to ASTM G21.
   2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
   3. Service Temperature: Up to 250 degrees F.
   4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
   5. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.30.
      b. 1 inch Thickness: 0.45.
      c. 1-1/2 inches Thickness: 0.60.
      d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type, ASTM C916.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been sealed and air leak tested per Section 23 3100 - HVAC Ducts and Casings before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below 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.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

F. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Outside Air Intake Ducts:

B. Supply Ducts: 2" Glass Fiber, Flexible

C. Return Ducts: 2" Glass Fiber, Flexible

D. Relief Ducts in Mechanical Rooms: 2" Glass Fiber, Flexible

E. Ducts Exposed to Outdoors: 2" Glass Fiber, Rigid with Exterior Insulation Jacket.

F. Supply Ducts From Fans to Vertical Ducts in Shafts (Cooling System): 2"

G. Exhaust Ducts: Not required.

H. Return and Relief Ducts in Mechanical Rooms:

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

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 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.03 REFERENCE STANDARDS

A. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

D. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. Maximum Service Temperature: 650 degrees F.
2. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 lb/cu ft density.
3. Weave: 5 by 5.

H. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.
2. Covering Adhesive Mastic: Compatible with insulation.

B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: Minus 40 degrees F.
b. Maximum Service Temperature: 180 degrees F.
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil.
e. Connections: Brush on welding adhesive.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Glass fiber insulated pipes conveying fluids above ambient temperature.
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. 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.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return (141 degrees F to 200 degrees F):
    a. 1-1/4" pipe and smaller: 1-1/2" Glass Fiber, Rigid
    b. 1-1/2" and larger: 2" Glass Fiber, Rigid

B. Cooling Systems:
1. Chilled Water (40 degrees F to 60 degrees F):
    a. 1-1/4" pipe and smaller: 0.5" Glass Fiber, Rigid.
    b. 1-1/2" pipe and larger: 1" Glass Fiber, Rigid.

END OF SECTION

SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

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 SECTION INCLUDES

A. Air Supply System:
   1. Control and instrumentation tubing.

B. Humidistats:
   1. Room humidistats.

C. Input/Output Sensors:
   1. Temperature sensors.
   2. Humidity sensors.

D. Thermostats:
   1. Room thermostat accessories.
   2. Outdoor reset thermostats.
   3. Airstream thermostats.

E. Transmitters:
   1. Building static pressure transmitters.

1.03 RELATED REQUIREMENTS

A. Section 23 0519 - Meters and Gauges for HVAC Piping: Thermometer sockets and gauge taps.

B. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

C. Section 23 2114 - Hydronic Specialties.

D. Section 23 3300 - Air Duct Accessories: Installation of automatic dampers.

E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

F. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.04 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

C. ASTM B32 - Standard Specification for Solder Metal; 2020.

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

E. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

F. ASTM B819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems; 2019.

G. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics; 2021.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

I. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Samples: Submit two of each type of room thermostat and cover.

E. Manufacturer's Instructions: Provide for all manufactured components.

F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

G. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

H. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 AIR SUPPLY SYSTEM

A. Control and Instrumentation Tubing:
   1. Copper Tubing:
      a. ASTM B819 Type K, or ASTM B88 (ASTM B88M) Type K (A), seamless, H or O temper (drawn or annealed).
   2. Polyethylene Tubing:
      a. Black, flame retardant, virgin polyethylene, resistant to environmental stress-cracking when tested in accordance with ASTM D1693.
      b. Fittings: UL labeled, rod or forged brass rated to 200 psig at 100 degrees F.
      c. Joints: Compression or barbed type.

2.03 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
   2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
   3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
   4. Temperature Sensing Device: Compatible with project DDC controllers.

5. Performance Characteristics:
    a. RTD:
        1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
        2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
        3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
        4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
        5) Range: Minus 40 degrees F through 220 degrees F minimum.
    b. Thermistor:
        1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
        2) Range: Minus 25 degrees F through 122 degrees F minimum.
        3) Heat Dissipation Constant: 2.7 mW per degree C.
    c. Temperature Transmitter:
        1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
        2) Output: 4 to 20 mA.
    d. Sensing Range:
        1) Provide limited range sensors if required to sense the range expected for a respective point.
        2) Use RTD type sensors for extended ranges beyond minus 30 degrees F to 230 degrees F.
        3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
    e. Wire Resistance:
        1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
        2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
    f. Room Sensors: Locking cover .
    g. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
    h. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.
    i. Room Temperature Sensors:
        1) Construct for surface or wall box mounting.
        2) Provide the following:
            (a) Setpoint reset slide switch with an adjustable temperature range.
            (b) Individual heating/cooling setpoint slide switches.
            (c) Momentary override request push button for activation of after-hours operation.
            (d) Analog thermometer.
    j. Room Temperature Sensors with Integral Digital Display:
        1) Provide a four button keypad with the following capabilities:
            (a) Indication of space and outdoor temperatures.
            (b) Display and control fan operation status.
            (c) Manual occupancy override and indication of occupancy status.
            (d) Controller mode status.
            (e) Password enabled setpoint and override modes.
    k. Temperature Averaging Elements:
        1) Use on duct sensors for ductwork 10 sq ft or larger.
        2) Use averaging elements where prone to stratification with sensor length 8 ft, or 16 ft.
        3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.
    l. Insertion Elements:

1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Humidity Sensors:
1. Elements: Accurate within 5 percent full range with linear output.
2. Room Sensors: With locking cover , span of 10 to 60 percent relative humidity.
3. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 - 100 percent relative humidity.
4. Static Pressure Sensors:
a. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
b. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
c. Accuracy: One percent of full scale with repeatability 0.3 percent.
d. Output: 0 - 5 vdc with power at 12 to 28 vdc.
5. Equipment Operation Sensors:
a. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
b. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.
c. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
6. Digital to Pneumatic Transducers:
a. Convert plus or minus 12 vdc pulse width modulation outputs to 0 to 20 psi.
7. Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 - 100 percent damper travel.
8. Carbon Monoxide Detectors:
a. Single or multichannel dual level detectors, using solid state sensors with three year minimum life. Sensor replacement shall take maximum 15 minutes. Suitable over temperature range of 23 to 130 degrees F.
b. Provide individual indicators and contractors for each level, initially calibrated for 50 ppm and 100 ppm.
c. Maximum response time to 100 ppm CO calibration gas: Two minutes.
9. Carbon Dioxide Sensors:
a. General: Provide non-dispersive infrared (NDIR) CO2 sensors with integral transducers and linear output.
1) Linear, CO2 Concentration Range Display: 0 to 2000 ppm.
2) Full Scale Accuracy: Plus/minus 100 ppm or plus/minus 5 percent of reading which ever is higher.
3) Maximum Response Time: 1 minute.
4) Analog Output: 0-10 VDC.
5) Rated Ambient Conditions:
(a) Air Temperature: Range of 32 to 122 degrees F.
(b) Relative Humidity: Range of 0 to 95 percent (non-condensing).
b. Calibration Characteristics:
1) Automatically compensating algorithm for sensor drift due to sensor degradation.
2) Maximum Drift: 2 percent.
3) User calibratable with a minimum calibration interval of 5 years.
c. Construction:
1) Sensor Chamber: Non-corrosive material for neutral effect on carbon dioxide sample.
2) Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.

2.04 THERMOSTATS

A. Room Thermostat Accessories:
   1. Thermostat Covers: Brushed aluminum.
   2. Insulating Bases: For thermostats located on exterior walls.
   3. Thermostat Guards: Metal mounted on separate base.
   4. Adjusting Key: As required for device.
   5. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

B. Outdoor Reset Thermostats:
   1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
   2. Scale range: Minus 10 to 70 degrees F.

C. Immersion Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

D. Airstream Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
   2. Averaging service remote bulb element: 7.5 feet.

E. Electric Low Limit Duct Thermostats:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

F. Electric High Limit Duct Thermostats:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

2.05 TRANSMITTERS

A. Building Static Pressure Transmitters:
   1. One pipe, direct acting, double bell, scale range 0.01 to 6.0 inch wg positive or negative, and sensitivity of 0.0005 inch wg. Transmit electronic signal to receiver with matching scale range.

B. Pressure Transmitters:
   1. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.

C. Temperature Transmitters:
   1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degrees F span and plus or minus 1 percent for 50 degrees F span, with 50 degrees F. temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

D. Humidity Transmitters:
   1. One pipe, directly proportioned output signal to measured variable, linearity within plus or minus 1 percent for 70 percent relative humidity span, capable of withstanding 95 percent relative humidity without loss of calibration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount freeze protection thermostats using flanges and element holders.

C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

D. Provide separable sockets for liquids and flanges for air bulb elements.

E. Provide thermostats in aspirating boxes in front entrances.

F. Provide guards on thermostats in entrances.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Provide isolation (two position) dampers of parallel blade construction.

I. Provide pilot positioners on pneumatic damper operators sequenced with other controls.

J. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

K. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

L. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

M. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.03 MAINTENANCE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

B. Provide complete service of controls systems, including call backs, and submit written report of each service call.

C. In addition to normal service calls, make minimum of 4 complete normal inspections of approximately 12 hours duration to inspect, calibrate, and adjust controls.

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

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 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, buried.

C. Heating water piping, above grade.

D. Heating water and glycol piping, above grade.

E. Chilled water piping, buried.

F. Chilled water piping, above grade.

G. Equipment drains and overflows.

H. Pipe hangers and supports.

I. Unions, flanges, mechanical couplings, and dielectric connections.

J. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.
   4. Gate Valves

K. Flow controls.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 08 3100 - Access Doors and Panels.

C. Section 09 9123 - Interior Painting.

D. Section 23 0553 - Identification for HVAC Piping and Equipment.

E. Section 23 0719 - HVAC Piping Insulation.

F. Section 23 2114 - Hydronic Specialties.

G. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.04 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

G. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2019a.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

I. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2014 (Reapproved 2020).

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.

K. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.

L. ASTM B32 - Standard Specification for Solder Metal; 2020.

M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

O. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

P. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2018.

Q. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2016).

R. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

S. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992, with Editorial Revision (2018).

T. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).

U. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

V. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

W. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

X. AWWA C606 - Grooved and Shouldered Joints; 2015.

Y. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturers catalogue information.
   3. Indicate valve data and ratings.
   4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum 3 years of experience.

C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

D. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

E. Coupling Manufacturer:
   1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
   2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
   3. A distributor's representative is not considered qualified to perform the training.

F. Welder Qualifications: Certify in accordance with ASME BPVC-IX.
   1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.
   2. Provide a test weld for inspection by the owner and architect/engineer's representative.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.09 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect Engineer.
      b. Use rigid joints unless otherwise indicated.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
   1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
2. On discharge of condenser water pumps, use spring loaded check valves.
3. Isolate equipment using Buttefly Valves with lug end flanges or grooved mechanical couplings.
4. For throttling, bypass, or manual flow control services, use globe or ball valves.
5. For shut-off and to isolate parts of systems or vertical risers, use gate or ball valves.
6. For throttling service, use plug cocks. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

E. Welding Materials and Procedures: Conform to ASME BPVC-IX.

2.02 HEATING WATER PIPING, BURIED

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.

B. Steel Pipe Sizes 12 inch and Greater: ASTM A53/A53M, 3/8 inch wall, black with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.
2. Joints: Welded in accordance with AWS D1.1/D1.1M.
3. Casing: Closed glass cell insulation.

2.03 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Steel Pipe Sizes 12 Inch and Greater: ASTM A53/A53M, 3/8 inch wall, black, using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

C. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn for pipe 2 inch (50 mm) and under, using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
3. Mechanical Press Sealed Fittings: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of ASME B16.51 and IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall allow identification of an unpressed fitting during pressure testing to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.04 CHILLED WATER PIPING, BURIED

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black . Piping shall be preinsulated equal to Thermacore Ferro-Therm.
1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.

2. Joints: Welded in accordance with AWS D1.1/D1.1M.
3. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

B. Steel Pipe Sizes 12 Inch and Over: ASTM A53/A53M, 0.375 inch wall, black . Piping shall be preinsulated equal to Thermacore.
1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.
2. Joints: Welded in accordance with AWS D1.1/D1.1M.
3. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

2.05 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Steel Pipe Sizes 12 Inch and Greater: ASTM A53/A53M, 3/8 inch wall, black; using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

C. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn for pipe 2 inch (50 mm) and under; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
4. Mechanical Press Sealed Fittings: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of ASME B16.51 and IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall allow identification of an unpressed fitting during pressure testing to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.06 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
3. Mechanical Press Sealed Fittings: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of ASME B16.51 and IAPMO PS 117. Sealing elements for press fittings shall be EPDM.

Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall allow identification of an unpressed fitting during pressure testing to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.07 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.08 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:
   1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
   2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:
   1. Ferrous Piping: 150 psig forged steel, slip-on.
   2. Copper Piping: Bronze.
   3. Gaskets: 1/16 inch thick, preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections:
   1. Waterways:
      a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      b. Dry insulation barrier able to withstand 600 volt breakdown test.
      c. Construct of galvanized steel with threaded end connections to match connecting piping.
      d. Suitable for the required operating pressures and temperatures.
   2. Flanges:
      a. Dielectric flanges with same pressure ratings as standard flanges.
      b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      c. Dry insulation barrier able to withstand 600 volt breakdown test.
      d. Construct of galvanized steel with threaded end connections to match connecting piping.
      e. Suitable for the required operating pressures and temperatures.

2.09 BALL VALVES

A. Up To and Including 2 Inches:
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

B. Over 2 Inches:
   1. Ductile iron body, chrome plated stainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle or gear operated, flanged ends, rated to 800 psi.

2.10 GATE VALVES

A. 2 inches and smaller: MSS SP-80, Bronze, 1035 kPa (150 psig), wedge disc, rising stem, union bonnet.

B. 2-1/2 inches and larger: Flanged, outside screw and yoke. MSS SP-70, iron body, bronze mounted, 861 kPa (125 psig) wedge disc.

2.11 BUTTERFLY VALVES

A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.

B. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

C. Operator: 10 position lever handle.

2.12 SWING CHECK VALVES

A. Up To and Including 2 Inches:
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

2.13 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare piping connections to equipment using jointing system specified.

F. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

G. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Pressure rating: install components having a pressure rating equal to or greater than the system operating pressure.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

H. Slope piping and arrange to drain at low points.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
   1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
   2. Use flexible couplings in expansion loops.

J. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.
   2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

K. Mechanical Press connections: copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

L. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

M. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

N. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 0719.

O. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.

P. Use eccentric reducers to maintain top of pipe level.

Q. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

R. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 9123.

S. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   4. 2-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   5. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   6. 4 Inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.
   7. 6 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
   8. 8 Inches: Maximum span, 16 feet; minimum rod size, 5/8 inch.

B. Hanger Spacing for Steel Piping.
   1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
   6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
   7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
   8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

9. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.

END OF SECTION

SECTION 23 2114
HYDRONIC SPECIALTIES

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 SECTION INCLUDES

A. Balancing valves.

B. Pressure reducing valves.

1.03 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.04 REFERENCE STANDARDS

A. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2021.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

C. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Maintenance Contract.

F. Project Record Documents: Record actual locations of flow controls.

G. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 BALANCING VALVES

A. Size 2 inch and Smaller:
   1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
   2. Metal construction materials consist of bronze or brass.
   3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.

B. Size 2.5 inch and Larger:
   1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
   2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
   3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, or NORYL.

2.02 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 23 2113.

B. Materials of Construction:
   1. Valve Body: Constructed of bronze, cast iron, brass, or iron.
   2. Internal Components: Construct of stainless steel or brass and engineered plastics or composition material.

C. Connections:
   1. NPT threaded: 0.50 inch, or 0.75 inch.
   2. Soldered: 0.50 inch.

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 100 psi.

F. Maximum Fluid Temperature: 180 degrees F.

G. Operating Pressure Range: Between 10 psi and 25 psi.

END OF SECTION

SECTION 23 2500
HVAC WATER TREATMENT

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 SECTION INCLUDES

A. Liquid level switch.

B. Conductivity controller.

C. Water meter.

D. Solenoid valves.

E. Timers.

1.03 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Owner furnished treatment equipment.

B. Section 01 6000 - Product Requirements: Owner furnished treatment equipment.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2114 - Hydronic Specialties.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

E. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

F. Certificate: Submit certificate of compliance from Authority Having Jurisdiction indicating approval of chemicals and their proposed disposal.

G. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

H. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Sufficient chemicals for treatment and testing during required maintenance period.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 LIQUID LEVEL SWITCH

A. Polypropylene housing with integrally mounted PVC air trap, receptacles for connection to metering pump, and low level alarm.

2.02 CONDUCTIVITY CONTROLLER

A. Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and light, control function light, output to control circuit and recorder.

2.03 WATER METER

A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

2.04 SOLENOID VALVES

A. Forged brass body globe pattern, normally open or closed as required, explosion-proof and watertight solenoid enclosure, and continuous duty coil.

2.05 TIMERS

A. Electronic timers, infinitely adjustable over full range, 150 second and five minute range, mounted together in cabinet with hands-off-automatic switches and status lights.

2.06 SIDE-STREAM FILTRATION SYSTEM

A. System: Flow indicator, filter housing with cartridge filter, shut-off valves, and flow control valve.

B. Hot Water and Glycol Filter Housing: Glass reinforced nylon plastic suitable for 220 degrees F and 200 psi operating conditions.

C. Chilled Water Filter Housing: Reinforced polypropylene plastic housing suitable for 125 degrees F and 125 psi operating conditions.

D. Cartridges: 30 micron for start-up and 5 micron for system operation.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
   1. As recommended by manufacturer.

B. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
   2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
   3. Circulate for 6 hours at design temperatures, then drain.
   4. Refill with clean water and repeat until system cleaner is removed.

C. Chilled Water Systems:
   1. Circulate for 48 hours, then drain systems as quickly as possible.
   2. Refill with clean water, circulate for 24 hours, then drain.
   3. Refill with clean water and repeat until system cleaner is removed.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
   1. Provide minimum of two hours of instruction for two people.
   2. Have operation and maintenance data prepared and available for review during training.
   3. Conduct training using actual equipment after treated system has been put into full operation.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Owner.

E. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

F. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

G. Provide laboratory and technical assistance services during this maintenance period.

H. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

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 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Air plenums and casings

D. Duct Leakage Tests and Repair

1.03 RELATED REQUIREMENTS

A. Section 23 0713 - Duct Insulation: External insulation and duct liner.

B. Section 23 3300 - Air Duct Accessories.

C. Section 23 3700 - Air Outlets and Inlets.

1.04 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2016.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

E. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2015.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

G. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2015.

H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

J. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

K. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

L. SMACNA (ROUND) - Round Industrial Duct Construction Standards; 2013.

M. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

N. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

O. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

D. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Duct Sealing, Air Leakage Criteria, and Air Leakage Tests: Ducts shall be sealed as per duct sealing requirements of SMACNA HVAC Air Duct Leakage Test Manual for duct pressure classes shown on the drawings.

1.07 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.08 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Provide UL Class 1 reinforced ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide galvanized steel duct unless otherwise indicated.

C. Acoustical Treatment: Where indicated on the drawings, provide sound-absorbing liners and/or sectional silencers for metal-based ducts.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
   1. Round: Plus or minus 4 in-wc of galvanized steel.
   2. Rectangular: Plus or minus 1 in-wc of galvanized steel.
   3. Flat Oval: Plus 4 in-wc of galvanized steel.

E. Duct Sealing and Leakage in accordance with Static Pressure Class:
   1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
      a. Low Pressure Supply Air: 1 in-wc pressure class, galvanized steel.
      b. Medium and High Pressure Supply Air: 3 in-wc pressure class, galvanized steel.
      c. Outside Air Intake: 1/2 in-wc pressure class, galvanized steel.
      d. Return and Relief Air: 1 in-wc pressure class, galvanized steel.
      e. General Exhaust Air: 1 in-wc pressure class, galvanized steel.
      f. Combustion Air: 1/2 in-wc pressure class, galvanized steel.
      g. Transfer-air and Sound Boots: 1/2 in-wc pressure class.
   2. Low Pressure Service: Up to 2 in-wc:
      a. Seal: Class C, apply to seal off transverse joints.
      b. Leakage:
         1) Rectangular: Class 24 or 24 cfm/100 sq ft.
         2) Round: Class 12 or 12 cfm/100 sq ft.
   3. Medium and High Pressure Service: Above 3 in-wc:
      a. Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.
      b. Leakage:
         1) Rectangular: Class 6 or 6 cfm/100 sq ft.
         2) Round: Class 3 or 3 cfm/100 sq ft.

F. Materials:
   1. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

G. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 MANUFACTURED DUCTWORK AND FITTINGS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Flat-Oval Metal Ducts:
   1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
      a. Fittings: Manufacture at least two gauges heavier metal than the duct.
      b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
   2. Flat-Oval Double Wall Insulated Duct: Machine made from round spiral lock seam duct.
      a. Fittings: Manufacture with solid inner wall.
      b. Inner Wall: Perforated galvanized steel.
      c. Insulation:
         1) Thickness: 1 inch fiberglass.

C. Round Metal Ducts:
   1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
   2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
      a. Insulation:
         1) Thickness: 1 inch.
         2) Material: Fiberglass.
   3. Round Connection System: Interlocking duct connection system per SMACNA (DCS).

D. Round Spiral Duct:
   1. Round spiral lock seam duct with galvanized steel outer wall.

E. Connectors, Fittings, Sealants, and Miscellaneous:
   1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
   2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
      a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
      b. VOC Content: Not more than 250 g/L, excluding water.
      c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
      d. For Use with Flexible Ducts: UL labeled.

4. Gasket Tape:
    a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.

F. Slab Duct Ventilation System: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS, with G90/Z275 coating designed for installation in cast-in-place concrete floor assemblies.

G. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.
1. Insulation: R6 insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: Minus 20 degrees F to 250 degrees F.

2.03 FLEXIBLE DUCTS

A. Flexible Air Ducts:
1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
3. Pressure Rating: From 10 in-wc positive to 5 in-wc negative.
4. Maximum Velocity: 5000 fpm.
5. Temperature Range: Minus 20 to 210 degrees F.

B. Flexible Air Ducts:
1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
2. Insulation: Fiberglass insulation with aluminized vapor barrier film.
3. Pressure Rating: From 10 in-wc to 5 in-wc negative.
4. Maximum Velocity: 5000 fpm.
5. Temperature Range: Minus 20 to 210 degrees F.

2.04 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances per NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.

C. Where ducts are not self-draining back to equipment, provide low point drain pocket with the copper drain pipe to a sanitary sewer.

D. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

I. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

J. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.02 DUCT LEAKAGE TESTS AND REPAIR

A. Ductwork leakage testing shall be performed by the Testing and Balancing Contractor directly contracted by the General Contractor and independent of the Sheet Metal Contractor.

B. Ductwork leakage testing shall be performed for:
   1. The entire air distribution system, regardless of pressure classification (including all supply, return, exhaust and relief ductwork), section by section.
   2. Medium and High Pressure supply ductwork serving VAV systems (3 in-wc and above).
   3. Return ductwork serving VAV systems (all).
   4. Low pressure exhaust ductwork (1 in-wc and above).
   5. Low pressure supply and return ductwork (1 in-wc). Do not test supply ductwork downstream of terminal units.

C. Do not test flex duct run-outs to air devices or terminal units.

D. Test procedure, apparatus and report shall conform to SMACNA Leakage Test manual.

E. All ductwork shall be leak tested first before enclosed in a shaft, isolated, or covered in other inaccessible areas.

F. All tests shall be performed in the presence of the Commissioning Agent and the Test and Balance agency. The Test and Balance agency shall measure and record duct leakage and report to the Resident Engineer and identify leakage source with excessive leakage.

G. If any portion of the duct system tested fails to meet the permissible leakage level, the Contractor shall rectify sealing of ductwork to bring it into compliance and shall retest it until acceptable leakage is demonstrated to the Commissioning Agent.

H. All tests and necessary repairs shall be completed prior to insulation or concealment of ductwork.

I. Make sure all openings used for testing flow and temperatures by TAB Contractor are sealed properly.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

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 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Combination fire and smoke dampers.

C. Duct access doors.

D. Duct test holes.

E. Fire dampers.

F. Flexible duct connections.

G. Smoke dampers.

H. Volume control dampers.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 23 3100 - HVAC Ducts and Casings.

C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

D. NFPA 92 - Standard for Smoke Control Systems; 2018.

E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

F. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives; 2013

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

H. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

I. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.02 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Ceiling (Radiation) Dampers: Galvanized steel, 22 gage, 0.0299 inch frame and 16 gage, 0.0598 inch flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

C. Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

D. Maximum Installed Length: 14 inch.

2.06 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

C. Single Blade Dampers:

1. Fabricate for duct sizes up to 6 by 30 inch.
2. Blade: 24 gage, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

K. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

L. Use splitter dampers only where indicated.

M. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

N. Conduct operational testing, documentation, and training for owner's representative of all fire, smoke, and combination fire and smoke dampers as directed by NFPA 80, chapter 19 - Installation, Testing, and Maintenance of Fire Dampers and NFPA 105, chapter 6 - Installation, Testing, and Maintenance of Smoke Dampers.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

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 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.
   1. Ceiling-mounted, supply register/grilles.

C. Louvers.

1.03 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2021).

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers
   1. Ruskin: www.ruskin.com/category/11~Louver-and-Architectural-Solutions
   2. Greenheck: www.greenheck.com/products/air-control/louvers
   3. Pottorff: www.pottorff.com

B. Air Devices
   1. Titus: www.titus-hvac.com
   2. Price Industries: www.priceindustries.com
   3. Krueger-HVAC: www.krueger-hvac.com
   4. Tuttle and Bailey: www.tuttleandbailey.com

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DIFFUSERS

A. See the Air Device Schedule on the Contract Drawings

2.03 REGISTERS / GRILLES

A. See the Air Device Schedule on the Contract Drawings

2.04 CEILING SUPPLY REGISTERS/GRILLES

A. Color: As selected by architect..

2.05 LOUVERS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Provide air device manufacturer's plaster or mounting frame for installation of lay-in type air devices in hard ceilings.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.

END OF SECTION

SECTION 23 7313

MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coil section.

B. Filter and air cleaner section.

1.02 RELATED REQUIREMENTS

A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addendum (2011).

B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Errata (2020).

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

F. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
   5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. AHU manufacturer shall provide the following information with each shop drawing/product data submission:
   1. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.
   2. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
   3. All performance data, including capacities and airside and waterside pressure drops, for components.
   4. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
   5. For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also a fan curve shall be provided showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

6. A filter schedule must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.
7. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
8. A coil valve coordination schedule shall be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, coil type and corresponding section location within the AHU, valve style (e.g. global, ball), valve type (e.g. electronic 2-way/3-way), valve position (e.g. normally open/closed), size, flow coefficient (CV), and close-off pressure.
9. An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).
10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.

D. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Filters: One set for each unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by 1 as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

1.09 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

PART 2 PRODUCTS

2.01 GENERAL

A. Unit layout and configuration shall be as defined in project plans and schedule.
   1. Manufacturer to provide a full perimeter integral base frame for either ceiling suspension of units or to support and raise all sections of the unit for proper trapping. Base frame will either be bolted construction or welded construction. Refer to schedule for base height and construction type. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel. Unit base height to be included in total height required for proper trap height.

2.02 PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with an insulated, double-wall, stainless drain pan.
   1. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements. See section 2.07, paragraph F through H for specifications on intermediate drain pans between cooling coils.
   2. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
   3. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.
   4. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.
   5. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.
   6. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.
   7. If drain pans are required for heating coils, access sections, or mixing sections they will be indicated in the plans.

2.03 COILS

A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.
   1. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
   2. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
   3. Construct coil casings of stainless steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
   4. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

5. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.
6. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.
7. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
8. Hydronic Coils
    a. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.
    b. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.
    c. Headers shall be constructed of round copper pipe or cast iron.
    d. Tubes shall be 5/8-inch .016 copper, with aluminum fins.
    e. Hydronic coils shall be supplied with factory installed drain and vent piping to the unit exterior.

2.04 FILTERS

A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.
    1. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule
    2. Manufacturer shall provide one set of startup filters.
    3. Each filter section shall be provided with a factory-installed, flush-mounted Dwyer dial-type differential pressure gauge piped to both sides of the filter to indicate status. Gauge shall maintain a +/- 5 percent accuracy within operating temperature limits of -20°F to 120°F. Filter sections consisting of pre- and post-filters shall have a gauge for each.

2.05 DAMPERS

A. All dampers, with the exception of external bypass and multizones (if scheduled), shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

2.06 ACCESS SECTIONS

A. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual. Access section doors shall be constructed per Section 2.04.

2.07 DISCHARGE PLENUM SECTIONS

A. Plenums shall be provided as indicated in the schedule and plans to efficiently turn air and provide acoustical attenuation. Discharge plenum opening types and sizes shall be scaled to meet pressure drop requirements scheduled and align with duct takeoffs.
   1. Discharge plenum panels shall include an acoustical liner to meet acoustical requirements. The liner shall be fabricated from perforated material to prevent corrosion and designed to completely encapsulate fiberglass insulation. The perforation spacing and hole size shall be such as to prevent insulation breakaway, flake off, or delamination when tested at 9000 fpm, in accordance with UL 181 or ASTM C1071. Insulation material must be resistant to fungi in accordance with ASTM C1338.

2.08 COIL SECTION

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel.

B. Air Coils:
   1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

C. Fabrication:
   1. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
   2. Fins: Aluminum.
   3. Casing: Die formed channel frame of galvanized steel.

2.09 FILTER AND AIR CLEANER SECTION

A. Throwaway Filters:
   1. Minimum Efficiency Reporting Value: MERV 8 when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide fixed sheaves required for final air balance.

C. Make connections to coils with unions or flanges.

D. Hydronic Coils:

E. Field-wire each factory provided control for field installation.

END OF SECTION

SECTION 26 0010

ELECTRICAL GENERAL PROVISIONS

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 WORK INCLUDED

A. Work covered by this specification shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on accompanying plans and specified herein, and make final connections to all equipment.

B. This work shall include: The general layout of the complete electrical system; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, service equipment, fixtures, and other work. No rough-in or connection, etc. for mechanical equipment shall be done until coordination is completed with Division 23.

1.03 RELATED WORK

A. The Contractor shall be familiar with any work specified elsewhere in these specifications. Perform this work as specified herein.

1.04 LOCAL CONDITIONS

A. Unless otherwise required or specified under another section of these specifications, cutting and patching will be performed by the Contractor. Division 26 shall furnish sketches showing locations and sizes of all openings, chases, etc. required for the installation of work.

B. Division 26 shall furnish and locate sleeves and inserts required before floors and walls are built or he shall be responsible for the cost of cutting and patching required where such sleeves and inserts are not installed or where incorrectly located. Division 26 shall do all drilling required for installation of the hangers.

C. No cutting shall be permitted to any of the structural members without the written permission of the Architect Engineer.

D. Where openings are cut to permit installation of work, or cut to repair or remodel, any defects that may appear up to expiration of guarantee, patching shall be done by the trade whose work is disturbed, but shall be paid for by the Division cutting openings or causing the damage.

E. Roof curbs for electrical openings shall be provided and flashed by the Contractor. Division 26 shall advise the Contractor as to size, location and details of curbs required.

F. The Contractor shall furnish all foundations and supports required for electrical equipment. Division 26 shall furnish an approved layout of bases and supports to the Contractor.

G. In general, all floor-mounted equipment shall be installed on raised concrete bases. Concrete bases shall be not less than 6 inches high unless otherwise noted, and shall be poured in forms built of new dressed lumber. Foundation corners shall be neatly chamfered by means of sheet metal or triangular wood strips nailed to the form. Foundation bolts shall be placed in forms when concrete is poured; bolts shall be correctly located by means of templates. Allow 1 inch below equipment bases for alignment and grouting. After grouting, the forms will be removed and the surface of the foundations shall be hand-rubbed with carborundum.

H. Division 26 shall give full cooperation to other trades, furnishing, in writing, to the Architect Engineer, any information necessary to permit work of all trades to be installed satisfactorily and with the least possible interference or delay.

I. Where work of this Division will be installed close to work of other trades, or where there is evidence that the work will interfere with work of other trades, the Division 26 shall assist in working out space conditions to make satisfactory adjustment. If the Contractor installs work before coordinating with other trades, he shall make necessary changes in his work to correct the condition without extra charge.

J. Keep work area clean at all times. Daily remove all scraps and debris from work area.

1.05 PERMITS AND INSPECTIONS

A. Give all necessary notices; obtain all permits, and pay all governmental taxes, fees and other costs in connection with work; file all necessary plans; prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain required certificates of inspection for his work and deliver same to the Architect Engineer before request for acceptance and final payment of work.

B. Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, apparatus, drawings, etc. in order to comply with all laws, ordinances, rules and regulations, whether or not shown on the drawings and/or in the specifications.

1.06 CODES AND STANDARDS

A. The following specifications and standards, of issues listed below, but referred to thereafter by basic designation only, form part of these specifications:
   1. National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Amendments and Supplements.
   2. National Electrical Safety Code.
   3. National Fire Protection Association's Recommended Practices.
   4. Local, City and State Codes and Ordinances.
   5. Underwriters Laboratories, Inc.
   6. Illuminating Engineering Society.
   7. Institute of Electrical and Electronic Engineers.
   8. Insulated Cable Engineers Association.
   9. National Electrical Manufacturers Association.
   10. American National Standards Institute.
   11. American Society for Testing Materials.
   12. State Fire Prevention Code.
   13. Occupational Health Safety Act.
   14. National Electrical Contractor Standards..

B. The latest specifications and standards available shall be used for the above.

1.07 REVIEW OF MATERIALS

A. It is the intent of these specifications to establish quality standards of materials and equipment installed. Therefore, specific items are identified by manufacturer, trade name or catalog designation.

B. Should the Contractor propose to furnish material and equipment other than that specified, he shall submit a written request for any or all substitutions to the Architect Engineer. Such request shall be alternatives to the original bid, and shall be submitted complete with descriptive (manufacturer, brand name, catalog number, etc.), and technical data for all items. The Contractor shall submit written answers to the following questions for each substitution request:
   1. Is the substitution of equal, greater or less quality than the design requirements?
   2. If of less quality, what is the difference in value?
   3. If of equal or better quality, what are the advantages to the Owner in accepting the substitution at no change in contract price?

C. Where such substitutions alter the design or space requirements indicated on the drawings, the Contractor shall include all items of cost for the revised design and include cost of all applicable trades involved.

D. Acceptance or rejection of the proposed substitutions shall be subject to the approval of the Architect Engineer. If requested by the Architect Engineer, the Contractor shall submit for inspection samples of both the specified and proposed substitute items.

E. In all cases where substitutions are permitted, the Contractor shall bear any extra cost of evaluating the equality of the material and the equipment to be installed.

F. The Contractor shall submit to the Architect Engineer detailed dimensioned shop drawings covering all items of electrical equipment. No equipment should be put into manufacture or ordered until these shop drawings or brochures have been approved by the Architect Engineer.

G. The Contractor shall submit 5 physical copies or electronic copies of the shop drawings to the Architect Engineer for comment or correction.

H. In the event resubmittal is required, the Contractor shall revise the shop drawings as directed by the Architect Engineer. The Contractor shall then resubmit 5 physical copies or electronic copies of the corrected shop drawings to the Architect Engineer for final approval.

I. As soon as practicable and within 30 days after award of contract, and before beginning fabrication of material or installation of equipment, the Contractor shall submit a complete schedule of materials, equipment, apparatus and appurtenances proposed for installation and/or use in this project to the Architect Engineer for approval.

J. This schedule shall be in the form of a bill of materials and shall include manufacturer's names, catalog numbers, diagrams and other descriptive data as required for approval. Submittal procedure shall be the same as specified above.

K. Upon completion of the project, this Contractor shall prepare and deliver to the Architect Engineer one set of red-lined "RECORD SET" prints, showing actual installed locations of all electrical conduits, ducts and cables outside and inside of the buildings, including the location of all underground junction boxes, pull boxes, handholes and manholes. Make all necessary field measurements during the installation of the electrical work.

1.08 DEVIATIONS

A. The Drawings, which constitute an integral part of the contract, shall indicate the general layout of the complete electrical systems; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, unit substations, service equipment, fixtures and other work.

B. Field verification of scale dimensions on the drawings is directed since actual locations, distances and levels will be governed by actual field conditions.

C. The Contractor shall check architectural, structural, plumbing, heating and ventilating to avert possible installation conflicts. Should drastic changes from original drawings be necessary to resolve such conflicts, the Contractor shall notify the Architect Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

D. The drawings may be superseded by later revised or detailed drawings or specification addenda prepared by the Architect Engineer, and the Contractor shall conform to all reasonable changes without extra cost to the Owner. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation, shall be included.

1.09 SITE UTILITIES

A. Locations and elevations of various utilities, included within the scope of this work, have been obtained from city and utility maps and/or other substantially reliable sources, and are offered separately from contract documents as a general guide only without guarantee as to accuracy. The Contractor shall examine the site and verify to his own satisfaction the locations and elevations of all utilities and shall adequately inform himself of their relations to the work before entering into contract.

B. Voltage that appears on the drawings and elsewhere in these specifications has been obtained from the serving utility company. Before ordering equipment and starting the job, the Contractor shall verify the voltage with the utility company. If voltage differs from that noted on the drawings and in the specifications, the Architect Engineer shall be notified at once. If the Architect Engineer is not notified before equipment is ordered or construction is started, the Contractor shall provide an acceptable and operable system at no additional cost to the Owner.

C. Exterior utilities shall include all conduit and appurtenances outside of the building or as shown on the plans. Unless otherwise noted, utilities shall include complete tie-in with utility lines at no extra cost to the Owner. The Contractor shall pay all costs required by utility company

pertaining to construction and tie-in. Deposits required for permanent service shall be paid by the Owner.

1.10 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 Examiners 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.

PART 2 - PRODUCTS

2.01 GENERAL

A. Each item of equipment furnished under these specifications is to be essentially the standard product of the manufacturer; however, component parts of equipment need not be products of one manufacturer.

B. All material and equipment shall be new and of the best quality normally used in good commercial practice, being products of reputable manufacture. Each major component shall bear a name plate stating name and address of the manufacturer and catalog number or designation. All materials shall be of the manufacturer's latest design standard, and bear Underwriters Laboratories, Inc. label and the manufacturer's trade mark.

C. Where items of equipment and/or apparatus come under the following general headings; all of the equipment shall be from the same manufacturer:
   1. Busways, circuit breakers, load centers, metering equipment, panelboards, safety switches, starters, substations, switchboards and switchgear.

PART 3 - EXECUTION

3.01 GENERAL

A. All electrical construction work shall be installed under the direction of a competent supervisor who will be at the job site at all times when electrical installations are being made.

B. Installing Contractor will be held responsible for damage to other work resulting from negligence of his workmen. Such repairs shall be performed by the trade originally accomplishing the work but at the expense of Division 26.

C. The Contractor shall utilize only competent and skillful workmen in handling and installing equipment specified.

D. Installation shall be carried out in such a manner that the many components will function as a complete workable system including any accessories required to accomplish such installation. Equipment shall be left properly adjusted and in satisfactory working order. Work is to be executed in conformity with best acceptable standard practices with the equipment being installed to allow for maximum accessibility and best appearance. Installation shall be such that future installations and expansions can be made with a minimum of expenditure.

E. Where possible, work must be scheduled for accomplishment during periods acceptable to the Owner, but when such scheduling is not feasible, work shall be executed at night or over weekends. No additional compensation will be allowed for overtime.

F. Apparatus which is too large to permit access through stairways, doorways or shafts shall be brought to the job site by the Contractor involved and put in place before the closing of the structure.

G. Division 26 shall be responsible for the protection of electrical apparatus from damage and the elements. This shall include the erection of temporary shelters, cribbing, and the covering of apparatus in uncompleted areas of buildings with tarpaulins. Failure to comply with the foregoing by the Contractor to the satisfaction of the Architect Engineer will be sufficient cause for rejection of the piece of apparatus in question.

H. Chases, recesses, and other openings required for the location of conduits or equipment in new construction shall be provided by the Contractor. Division 26 shall advise the Contractor of the size and locations, and furnish all necessary drawings required for his work in sufficient time to allow for provision of chase.

I. After installation is complete, and at such time as the Architect Engineer may direct, the Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with the requirements of this specification. Test shall be performed in the presence of the Architect Engineer or authorized representative. Division 26 shall furnish instruments and personnel required for the test and Owner will furnish necessary electrical power.

J. The Contractor shall furnish a written certificate guaranteeing materials, equipment and labor furnished to be free of defects for a period of 1 year; except where otherwise indicated, from and after the date of final acceptance of the work by the Owner, and further agrees that if defects appear within stipulated guaranty period same shall be replaced or made good without charge.

3.02 SEISMIC QUALIFICTION OF EQUIPMENT

A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualification in accordance with ASCE-7.
   1. Transformers
   2. Panel Boards
   3. Circuit Breakers
   4. Motor Starters
   5. Switch Boards
   6. Light Fixtures

END OF SECTION

SECTION 26 0505

SELECTIVE DEMOLITION FOR ELECTRICAL

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 SECTION INCLUDES

A. Electrical demolition.

1.03 RELATED REQUIREMENTS

A. Section 01 7000 - Execution Requirements: Additional requirements for alterations work.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Architect Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company and Owner.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
2. PCB- and DEHP-containing lighting ballasts.
3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Wire pulling lubricant.

G. Cable ties.

H. Firestop sleeves.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Field Quality Control Test Reports.

D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet.

H. Manufactured wiring systems are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

I. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.
d. Travelers for 3-Way and 4-Way Switching: Pink.
e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation: www.generalcable.com/#sle.
d. Service Wire Co: www.servicewire.com/#sle.
e. Southwire Company: www.southwire.com/#sle.
f. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.06 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. American Polywater Corporation: www.polywater.com/#sle.
c. Ideal Industries, Inc: www.idealindustries.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

2. Listed and labeled as complying with UL 267.
3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
4. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

I. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 12 inches of slack at each outlet.

K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

R. Identify conductors and cables in accordance with Section 26 0553.

S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground plate electrodes.

G. Ground access wells.

1.03 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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

F. NFPA 99 - Health Care Facilities Code; 2018.

G. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2020.

H. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
   a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
   b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
   c. Provide connection from ground ring conductor to:
      1) Perimeter columns of metal building frame.
      2) Ground rod electrodes located as indicated.
6. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   d. Provide ground access well for each electrode.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

G. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
   1. Provide grounding electrode system for each separate building or structure.
   2. Provide equipment grounding conductor routed with supply conductors.
   3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
      b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
      c. Generators, when neutral is switched in the transfer switch.
   2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
   3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
   4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
   5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
   6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
   7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
      b. Metal gas piping.
   8. Provide bonding for interior metal air ducts.
   9. Provide bonding for metal building frame.
   10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

K. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

L. Lightning Protection Systems:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).
2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
a. Exceptions:
1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
a. Exceptions:
1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
a. allG Fabrication: www.allgfab.com/#sle.
b. Burndy LLC: www.burndy.com/#sle.
c. Harger Lightning & Grounding: www.harger.com/#sle.
d. Thomas & Betts Corporation: www.tnb.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

5. Manufacturers - Exothermic Welded Connections:
    a. Burndy LLC: www.burndy.com/#sle.
    b. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:
    a. allG Fabrication: www.allgfab.com/#sle.
    b. Harger Lightning & Grounding: www.harger.com/#sle.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. Manufacturers:
    a. allG Fabrication: www.allgfab.com/#sle.
    b. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
    c. Harger Lightning & Grounding: www.harger.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

F. Ground Plate Electrodes:
1. Material: Copper.
2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
3. Manufacturers:
    a. allG Fabrication: www.allgfab.com/#sle.
    b. Harger Lightning & Grounding: www.harger.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

G. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
    a. Round Wells: Not less than 8 inches in diameter.
    b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
    a. allG Fabrication: www.allgfab.com/#sle.
    b. Harger Lightning & Grounding: www.harger.com/#sle.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

H. Oxide Inhibiting Compound: Comply with Section 26 0519.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.

E. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

F. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.03 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.04 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

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

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 3000.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

E. Installer's qualification statement.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALITY ASSURANCE

A. Installer Qualifications for Field Welding: See Section 05 5000.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 4. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
   1. Manufacturers:

a. Substitutions: See Section 01 6000 - Product Requirements.

D. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
4. Channel Material:
a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
6. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
a. Equipment Supports: 1/2-inch diameter.
b. Busway Supports: 1/2-inch diameter.
c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
e. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
f. Outlet Boxes: 1/4-inch diameter.
g. Luminaires: 1/4-inch diameter.

F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
b. Comply with MFMA-4.
c. Channel Material: Use galvanized steel.
d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 3000.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

J. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners in accordance with manufacturer's recommended torque settings.

N. Remove temporary supports.

O. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

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 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Stainless steel rigid metal conduit (RMC).

C. Galvanized steel intermediate metal conduit (IMC).

D. Stainless steel intermediate metal conduit (IMC).

E. PVC-coated galvanized steel rigid metal conduit (RMC).

F. Flexible metal conduit (FMC).

G. Liquidtight flexible metal conduit (LFMC).

H. Galvanized steel electrical metallic tubing (EMT).

I. Stainless steel electrical metallic tubing (EMT).

J. Rigid polyvinyl chloride (PVC) conduit.

1.03 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 8400 - Firestopping.

C. Section 22 0548 - Plumbing Vibration Isolation and Seismic Restraint

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

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

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

O. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

P. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

T. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

U. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

V. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

W. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:
   1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.07 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

B. Multi-trade Coordination: In lieu of detailed shop drawings, the Contractor may conduct a pre-installation and coordination meeting, with follow-up meetings to coordinate routing of mechanical, fire protection and electrical elements. Locations and conflict resolutions shall be made during these meetings. Notify Architect-Engineer of meeting times and dates. Do not install any conduit until this meeting has taken place.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
   4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC) where emerging from underground.
   5. Where rigid polyvinyl (PVC) conduit is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, or PVC-coated galvanized steel rigid metal conduit (RMC) elbows for bends.
   6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Embedded Within Concrete:
   1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
   2. Within Slab Above Ground: Not permitted.
   3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
    1. Locations subject to physical damage include, but are not limited to:
        a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
        b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
    1. Locations subject to severe physical damage include, but are not limited to:
        a. High traffic industrial and warehouse areas where exposed below 8 feet, except within electrical and communication rooms or closets.
        b. Where exposed below 20 feet in industrial manufacturing areas.

L. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

M. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
    1. Exterior locations subject to severe physical damage include, but are not limited to:
        a. Where exposed to vehicular traffic below 20 feet.

N. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

O. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

P. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

Q. Flexible Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit (FMC).
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

R. Panelboard feeders: Use galvanized steel rigid metal conduit.

S. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
   1. Where permitted, existing conduits to be reused may be used as sole equipment grounding conductor only when continuity of conduit pathway, including associated boxes and fittings, is verified; see Section 26 0526.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch trade size.
   2. Branch Circuit Homeruns: 3/4-inch trade size.
   3. Control Circuits: 1/2-inch trade size.
   4. Flexible Connections to Luminaires: 1/2-inch trade size.
   5. Underground, Interior: 1-inch trade size.
   6. Underground, Exterior: 1-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
   2. Nucor Tubular Products: www.nucortubular.com/#sle.
   3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
   4. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
      c. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
    a. Where not subject to severe corrosive influence, stainless steel fittings may be used.
    b. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
3. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
1. Material: Type 304 or 316 stainless steel.

C. Fittings:
1. Manufacturers:
    a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
    b. Eaton: www.eaton.com/#sle.
    c. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
    d. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use stainless steel with corrosion resistance equivalent to conduit.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Manufacturers:
    a. ABB; T&B: www.electrification.us.abb.com/#sle.
    b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
    c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
    d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.

a. Where not subject to severe corrosive influence, stainless steel fittings may be used.
b. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
6. More than Five Feet from Foundation Wall:
   a. In Dirt: Use rigid steel conduit.
   b. Under Road: Use rigid steel conduit.
7. In or Under Slab on Grade: Use Schedule 40 PVC.

D. Slab Penetrations:
1. Vertical penetrations: Use rigid steel conduit.
2. Elbows: Use rigid steel conduit.

E. Motor and other moving equipment connections:
1. Dry locations: Flexible steel conduit.
2. Damp locations: Liquid-tight flexible steel conduit.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
1. Material: Type 304 or 316 stainless steel.

C. Fittings:
1. Manufacturers:
   a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
   b. Eaton: www.eaton.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use stainless steel with corrosion resistance equivalent to conduit.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. ABB; Ocal: www.electrification.us.abb.com/#sle.
2. Calbond, a division of Atkore International www.calbond.com/#sle
3. Allied Tube & Conduit: www.alliedtube.com.
4. Robroy Industries: www.robroy.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

E. PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.

4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.
6. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.08 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Flex Tubes: www.flex-tubes.com
3. Electri-Flex Company: www.electriflex.com.
4. International Metal Hose: www.metalhose.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:
1. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.

2.09 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.

2.10 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com.
2. Nucor Tubular Products: www.nucortubular/#sle.
3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
4. Wheatland Tube Company: www.wheatland.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland or set-screw type.
a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

2.11 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
1. Material: Type 304 or 316 stainless steel.

C. Fittings:
1. Manufacturers:
a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use stainless steel with corrosion resistance equivalent to conduit.
4. Connectors and Couplings: Use compression/gland or set-screw type.

2.12 NONMETALLIC CONDUIT

A. Manufacturers:
1. ABB; Carlon: www.carlon.com/#sle.
2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
3. Cantex Inc: www.cantexinc.com/#sle.
4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
5. JM Eagle: www.jmeagle.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.13 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
   1. Products:
      a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
      b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
   1. Products:
      a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

J. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.
   1. Products:
      a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

K. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.
   1. Products:
      a. Advance Products & Systems, LLC; Bore Spacers: www.apsonline.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
   5. Unless otherwise approved, do not route exposed conduits:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.
   8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
   9. Arrange conduit to provide no more than 150 feet between pull points.
   10. Route conduits above water and drain piping where possible.
   11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.
      c. Flues.
   14. Group parallel conduits in same area on common rack.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

K. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 18 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.
2. Secure conduits to prevent floating or movement during pouring of concrete.

M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 3000.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where conduits are subject to earth movement by settlement or frost.

O. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
      c. Where conduits penetrate coolers or freezers.
   3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.

P. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

Q. Provide grounding and bonding; see Section 26 0526.

R. Identify conduits; see Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

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 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.03 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (R2020).

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

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Project Record Documents: Record actual locations for pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
5. Use suitable concrete type boxes where flush-mounted in concrete.
6. Use suitable masonry type boxes where flush-mounted in masonry walls.
7. Use raised covers suitable for the type of wall construction and device configuration where required.
8. Use shallow boxes where required by the type of wall construction.
9. Do not use "through-wall" boxes designed for access from both sides of wall.

10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
15. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
16. Wall Plates: Comply with Section 26 2726.
17. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.
    f. Substitutions: See Section 01 6000 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
5. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
   10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.
      c. Electrical rooms.
      d. Mechanical equipment rooms.

H. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 0526.

Q. Do not mount boxes back-to-back.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 0548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 01 4533 - Special Inspections.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

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

G. MFMA-4 - Metal Framing Standards Publication; 2004.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

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

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.

5. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

1.07 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

D. Conduit Isolation:

1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
2. Vibration Isolators:

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Electrical components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. Electrical components required to function for life safety purposes after an earthquake.

D. Seismic Restraints:
   1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Seismic Restraint Exemptions:
      a. Exemptions for Seismic Design Category C:
         1) Electrical components where either of the following apply:
            (a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
            (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
      b. Conduit, Cable Tray, and Raceway Exemptions, All Seismic Design Categories:
         1) Raceways with component importance factor (Ip) of 1.0 where flexible connections are provided between cable tray or raceway and associated components, where cable tray or raceway is positively attached to the structure, and where one of the following apply:
            (a) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
            (b) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
            (c) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
            (d) Hanger supported conduits, cable trays, or raceways with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.
         2) Conduits less than 2-1/2 inch trade size.
      c. Lighting Exemptions, All Seismic Design Categories:
         1) Suspended luminaires where attachments are designed to accommodate 1.4 times the operating weight acting in both the vertical and horizontal directions and connections to structure allow for 360 degree range of motion in the horizontal plane; arrange to prevent impact between luminaires and the structure or other nonstructural components.

2) Lay-in luminaires weighing less than 56 pounds secured to ceiling grid and provided with safety wires in accordance with ASTM E580/E580M.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 413.
   c. FEMA E-74.
   d. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
   c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

E. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:

1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect Engineer in accordance with Section 01 4533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

D. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   2. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   3. Adjust isolators to be free of isolation short circuits during normal operation.
   4. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
   6. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
      b. Install restraints within permissible angles in accordance with seismic design.
      c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
      d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
      e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Seismic Controls:
   1. Verify snubbing element air gaps.

E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

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 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Conduit and raceway markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

H. Instruction signs.

1.03 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.

1.04 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

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

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions and graphic features of identification products.

D. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.07 QUALITY ASSURANCE

A. Comply with requirements of the National Electrical Code - NFPA 70 (NEC).

1.08 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
         5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Transformers:
         1) Identify kVA rating.
         2) Identify voltage and phase for primary and secondary.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify load(s) served. Include location when not within sight of equipment.
      c. Enclosed switches, circuit breakers, and motor controllers:
         1) Identify voltage and phase.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Identify load(s) served. Include location when not within sight of equipment.
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.
      b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
   3. Emergency System Equipment:
      a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
      b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
      c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
   4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
   5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
   6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.

7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
8. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
9. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
10. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
11. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
12. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
13. Arc Flash Hazard Warning Labels: Comply with Section 26 0573.
14. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
15. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
16. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
17. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
4. Use underground warning tape to identify direct buried cables.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
a. Brady Corporation: www.bradyid.com/#sle.
b. Brother International Corporation: www.brother-usa.com/#sle.
c. Panduit Corp: www.panduit.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
a. System designation where applicable:
1) Emergency Power System: Identify with text "EMERGENCY".
2) Fire Alarm System: Identify with text "FIRE ALARM".
b. Equipment designation or other approved description.
c. Other information as indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
a. System Designation: 1 inch.
b. Equipment Designation: 1/2 inch.
c. Other Information: 1/4 inch.
5. Color:
a. Normal Power System: White text on black background.
b. Emergency Power System: White text on red background.
c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.
a. Exceptions:
1) Provide white text on red background for general information or operational instructions for emergency systems.
2) Provide white text on red background for general information or operational instructions for fire alarm systems.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

G. Nameplate Inscription:
1. Nameplates must adequately describe the function or use of the particular equipment to which it is attached. Where nameplates are detailed on the drawings, inscription and size of leters shall be as shown. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. Example: "Panel A, 277/480 v, 3-phase, 4-wire".
2. The name of the machine on the motor nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and PB station nameplates for that machine.
3. Use 1-7/8 inch letters for identifying signs on enclosures containing high voltage equipment. Signs shall read "DANGER - HIGH VOLTAGE".
4. Warning signs (items 3 & 4 above) to be of standard manufacture, fabricated of 18 ga. steel, or heavier, with a porcelain enamel finish. Letters shall be red on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. HellermannTyton: www.hellermanntyton.com/#sle.
3. Panduit Corp: www.panduit.com/#sle.
4. Seton Identification Products: www.seton.com/aec.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

E. Legend:

1. Markers for Voltage Identification: Highest voltage present.

F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.
4. The C. H Hanson Co.: www.chhanson.com
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.

C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

A. Manufacturers:
1. Brimar Industries, Inc: www.brimar.com/#sle.
2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
1. Materials:
a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
a. Do not use labels designed to be completed using handwritten text.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

C. Install wire, cable and underground markers per manufacturers' instructions.

D. Install conduit, raceway and instructions signs parallel to lines and surrounding surfaces. Install instruction signs in a clearly visible location, straight and square to surroundings.

END OF SECTION

SECTION 26 0573
POWER SYSTEM STUDIES

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 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.03 RELATED REQUIREMENTS

A. Section 26 0553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 26 2416 - Panelboards.

1.04 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 1 - Motors and Generators; 2018.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2021.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Existing Installations: Coordinate with equipment manufacturer(s) to obtain data necessary for completion of studies.
   2. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
   3. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Pre-Study Meeting: Conduct meeting with Owner to discuss system operating modes and conditions to be considered in studies.

C. Sequencing:
   1. Submit study reports prior to or concurrent with product submittals.
   2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect Engineer.
   3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

D. Scheduling:
   1. Arrange access to existing facility for data collection with Owner.
   2. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Study preparer's qualifications.

C. Study reports, stamped or sealed and signed by study preparer.

D. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
   1. Include characteristic time-current trip curves for protective devices.
   2. Include impedance data for busway.
   3. Include impedance data for engine generators.
   4. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   5. Include documentation of listed series ratings upon request.
   6. Identify modifications made in accordance with studies that:
      a. Can be made at no additional cost to Owner.
      b. As submitted will involve a change to the contract sum.

E. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

F. Site-specific arc flash hazard warning labels.

G. Field quality control reports.

H. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

I. Project Record Documents: Revise studies as required to reflect as-built conditions.
   1. Include hard copies with operation and maintenance data submittals.
   2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.07 POWER SYSTEM STUDIES

A. Scope of Studies:
   1. Perform analysis of both new and directly affected existing portions of electrical distribution system as indicated on drawings.
   2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
   3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:
   1. Comply with NFPA 70.
   2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
        1) Obtain up-to-date information from Utility Company.
    b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
    c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
    d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
    e. Protective Devices:
        1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
        2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
    f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
    g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
2. Existing Installations:
    a. Collect data on existing electrical distribution system necessary for completion of studies, including field verification of available existing data (e.g. construction documents, previous studies). Include actual settings for field-adjustable devices.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
    a. Maximum utility fault currents.
    b. Maximum motor contribution.
    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
    a. For single-phase systems, study preparer to perform calculations assuming three-phase system in accordance with IEEE 1584 using single phase bolted fault current, yielding conservative results.

3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.
4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    a. Maximum and minimum utility fault currents.
    b. Maximum and minimum motor contribution.
    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
    a. Identify date of study and study preparer.
    b. Identify study methodology and software product(s) used.
    c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
    d. Identify base used for per unit values.
    e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
    f. Include conclusions and recommendations.
2. Short-Circuit Study:
    a. For each scenario, identify at each bus location:
        1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
        2) Fault point X/R ratio.
        3) Associated equipment short circuit current ratings.
    b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
    a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    b. For each graph include (where applicable):
        1) Partial single-line diagram identifying the portion of the system illustrated.
        2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
        3) Conductors: Damage curves.
        4) Transformers: Inrush points and damage curves.
        5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
        6) Motors: Full load current, starting curves, and damage curves.
        7) Capacitors: Full load current and damage curves.
    c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
        1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
        2) Include ground fault pickup and delay.
        3) Include fuse ratings.
        4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
    a. For the worst case for each scenario, identify at each bus location:
        1) Calculated incident energy and associated working distance.
        2) Calculated arc flash boundary.

3) Bolted fault current.
4) Arcing fault current.
5) Clearing time.
6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.08 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
   1. Study preparer may be employed by manufacturer of electrical distribution equipment.

B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.

C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
   1. Products:
      a. EasyPower LLC: www.easypower.com/#sle.
      b. Power Analytics Corporation: www.poweranalytics.com/#sle.
      c. SKM Systems Analysis, Inc: www.skm.com/#sle.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 26 0553.
   2. Minimum Size: 4 by 6 inches.
   3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include orange header that reads "WARNING" unless otherwise indicated.
      b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
      c. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Site-specific PPE (personnel protective equipment) requirements.
         4) Nominal system voltage.
         5) Limited approach boundary.
         6) Restricted approach boundary.
         7) Equipment identification.
         8) Study preparer, report reference, and date calculations were performed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 0553.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Adjust equipment and protective devices for compliance with studies and recommended settings.

E. Notify Architect Engineer of any conflicts with or deviations from studies. Obtain direction before proceeding.

F. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

A. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.

1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 26 0583
WIRING CONNECTIONS

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 SECTION INCLUDES

A. Electrical connections to equipment.

1.03 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0533.13 - Conduit for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices.

1.04 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

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

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Division 23 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.13.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0533.16.

2.02 EQUIPMENT CONNECTIONS

A. Coordinate Requirements with Division 23 (15):
   1. Electrical Connection: Flexible conduit.
   2. Provide field-installed disconnect switch where required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

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 SECTION INCLUDES

A. Occupancy sensors.

B. Lighting contactors.

C. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0573 - Power System Studies.

D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices; 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

F. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

G. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

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

I. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

J. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Notify Architect Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Lutron Electronics Company, Inc: www.lutron.com/sle.
   3. RAB Lighting, Inc; _____: www.rablighting.com/#sle.
   4. Sensor Switch Inc: www.sensorswitch.com/#sle.
   5. WattStopper: www.wattstopper.com/#sle.
   6. Leviton: www.leviton.com.
   7. Greengate/Cooper: www.cooperlighting.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

9. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
      d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
   7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   8. Sensitivity: Field adjustable.
   9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
   10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
   12. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

C. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
      c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
      d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
      e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
      f. Provide selectable audible alert to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
c. Provide field selectable setting for disabling LED motion detector visual indicator.
d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.

E. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
b. Provide field selectable setting for disabling LED motion detector visual indicator.
c. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Directional Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

F. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating:
    a. Incandescent Load: Not less than 15 A.
    b. Fluorescent Load: Not less than 20 A.

2.03 LIGHTING CONTACTORS

A. Manufacturers:
1. ABB/GE: www.electrification.us.abb.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Rockwell Automation Inc; Allen-Bradley Products;.: ab.rockwellautomation.com/#sle.
4. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
5. Siemens Industry, Inc;.: www.usa.siemens.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
1. Disconnects: Circuit breaker type.
    a. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
    b. Provide auxiliary interlock for disconnection of external control power sources where applicable.

D. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 0573.

E. Enclosures:
1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish: Manufacturer's standard unless otherwise indicated.

2.04 ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
      b. In-Wall Time Switches: 48 inches above finished floor.
      c. In-Wall Interval Timers: 48 inches above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Provide required supports in accordance with Section 26 0529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:
   1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Combination Enclosed Lighting Contactors:
   1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

M. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

N. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect Engineer.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of lighting control devices to Architect Engineer, and correct deficiencies or make adjustments as directed.

C. Training: Train 's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION

SECTION 26 2416
PANELBOARDS

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 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.03 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.04 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Substitutions: See Section 01 6000 - Product Requirements.

F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Listed series ratings are not acceptable.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
   3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
      c. Provide painted steel boxes for surface-mounted panelboards, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
a. Use zero sequence ground fault detection method unless otherwise indicated.
b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

L. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

N. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

O. Load centers are not acceptable.

P. Provide the following features and accessories where indicated or where required to complete installation:
1. Feed-through lugs.
2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      a. Provide the following field-adjustable trip response settings:
         1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         2) Long time delay.
         3) Short time pickup and delay.
         4) Instantaneous pickup.
         5) Ground fault pickup and delay where ground fault protection is indicated.
      b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
      c. Provide communication capability where indicated: Compatible with system indicated.
   6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:
    a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
    b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
    c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
    d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
    e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
    c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
    d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
    e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.06 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

K. Provide grounding and bonding in accordance with Section 26 0526.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

L. Install all field-installed branch devices, components, and accessories.

M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.

P. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

Q. Provide filler plates to cover unused spaces in panelboards.

R. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated.

S. Identify panelboards in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

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 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.03 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

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

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
   6. Notify Architect Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Project Record Documents: Record actual installed locations of wiring devices.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

2.03 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   4. Greengate/Cooper: www.cooperlighting.com;
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.05 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc: www.lutron.com/sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
   1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Do not share neutral conductor on branch circuits utilizing wall dimmers.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Do not install devices back-to-back.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 2816.16
ENCLOSED SWITCHES

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 SECTION INCLUDES

A. Enclosed safety switches.

1.03 RELATED REQUIREMENTS

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: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
      a. Provide means for locking handle in the ON position where indicated.

O. Provide the following features and accessories where indicated or where required to complete installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2913

ENCLOSED CONTROLLERS

PART 2 PRODUCTS

1.01 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Service Conditions:
   1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
      a. Altitude:
         1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
         2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
      b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
   2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Short Circuit Current Rating:

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.

H. Instrument Transformers:
   1. Comply with IEEE C57.13.
   2. Select suitable ratio, burden, and accuracy as required for connected devices.
   3. Current Transformers: Connect secondaries to shorting terminal blocks.
   4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

1.02 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
   1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
   2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
   3. Trip-free operation.
   4. Visible trip indication.
   5. Resettable.
      a. Employ manual reset unless otherwise indicated.
      b. Do not employ automatic reset with two-wire control.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

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 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

1.04 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices; 2020.

I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

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

K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

M. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

N. UL 1598 - Luminaires; Current Edition, Including All Revisions.

O. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 2-year manufacturer warranty for linear fluorescent ballasts.

D. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

E. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

F. Provide 3-year full warranty for fluorescent emergency power supply units.

1.11 EXTRA MATERIALS

A. See Section 016000 - Product Requirements, for additional provisions.

B. Furnish two of each plastic lens type.

C. Furnish one replacement lamps for each lamp type.

D. Furnish two of each ballast type.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

K. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

L. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Sealed maintenance-free lead calcium unless otherwise indicated.
   2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

G. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   3. Provide compatible accessory wire guards where indicated.
   4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

C. Accessories:
   1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.
   2. Provide compatible accessory wire guards where indicated.
   3. Substitutions: See Section 01 6000 - Product Requirements.
   4. Provide fixtures complying with NFPA 101.
   5. Style: Translucent glass face with green letters on white background.
   6. Housing: Extruded aluminum.
   7. Lamps: LED.
   8. Directional Arrows: Universal type for field adjustment.
   9. Mounting: As indicated.
   10. Battery: 6 volt, nickel-cadmium type, with 1.5 hour capacity.
   11. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
   12. Input Voltage: 120 volts.

2.05 BALLASTS AND DRIVERS

A. Manufacturers:
   1. Alloy LED; www.alloyled.com/#sle.
   2. California Accent Lighting, Inc: www.calilighting.com/#sle.
   3. General Electric Company/GE Lighting: www.gelighting.com/#sle.
   4. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   5. OSRAM Sylvania, Inc: www.osram.us/ds/#sle.

6. Philips Lighting North America Corporation; www.usa.lighting.philips.com/#sle.
7. Substitutions: See Section 01 6000 - Product Requirements.
8. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
9. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

C. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Provide required support and attachment in accordance with Section 26 0529.

F. Provide required seismic controls in accordance with Section 26 0548.

G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H. Suspended Ceiling Mounted Luminaires:
1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

I. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

J. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
4. Install canopies tight to mounting surface.
5. Unless otherwise indicated, support pendants from swivel hangers.

K. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

L. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

M. Install accessories furnished with each luminaire.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

O. Bond products and metal accessories to branch circuit equipment grounding conductor.

P. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

Q. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

R. Remote Ballasts/Drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.

S. Identify luminaires connected to emergency power system in accordance with Section 26 0553.

T. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection in accordance with Section 014000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect Engineer.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect Engineer or authority having jurisdiction.

D. Aim and adjust fixtures as indicated.

E. Position exit sign directional arrows as indicated.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect Engineer, and correct deficiencies or make adjustments as directed.

C. Just prior to Substantial Completion, replace all lamps, ballasts, modules, drivers, etc that have failed..

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27 0529

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual, 7th Edition; 2017.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

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

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e.

J. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

K. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable supports, channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

C. Derating Calculations for Fiberglass Channel/Strut Framing Systems: Indicate load ratings adjusted for applicable service conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. TIA-569.
      b. NFPA 70.
      c. Applicable building code.
      d. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 4. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
   1. Applications:
      a. Do not exceed 5 feet between cable supports.
      b. Maximum Number of Cables per Cable Support:
         1) J-Hooks: 50, regardless of capacity.
      c. Allowable Cable Types:
         1) J-Hooks: Category 3, Category 5e, and Category 6.
   2. Comply with TIA-569.
   3. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
   4. J-Hooks: Noncontinuous cabling support with removable top retainer clip.
      a. Material: Use galvanized steel, factory-painted steel, or stainless steel.
      b. Provide support surfaces with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported.

c. Provide multitiered J-hooks where required to support multiple cabling systems.
d. Color coding to be visible from below after installation.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
4. Channel Material:
a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
6. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
a. Equipment Supports: 1/2-inch diameter.
b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
e. Outlet Boxes: 1/4-inch diameter.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
b. Comply with MFMA-4.
c. Channel Material: Use galvanized steel.
d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Provide required seismic controls.

I. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

K. Secure fasteners in accordance with manufacturer's recommended torque settings.

L. Remove temporary supports.

M. Identify independent communications component support wires above accessible ceilings, where permitted, with color distinguishable from other support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 27 0533.13

CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Stainless steel rigid metal conduit (RMC).

C. Galvanized steel intermediate metal conduit (IMC).

D. Stainless steel intermediate metal conduit (IMC).

E. PVC-coated galvanized steel rigid metal conduit (RMC).

F. Flexible metal conduit (FMC).

G. Liquidtight flexible metal conduit (LFMC).

H. Galvanized steel electrical metallic tubing (EMT).

I. Stainless steel electrical metallic tubing (EMT).

J. Rigid polyvinyl chloride (PVC) conduit.

K. Inside-plant flexible nonmetallic communications raceway/innerduct.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual, 7th Edition; 2017.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. BICSI TDMM - Telecommunications Distribution Methods Manual, 13th Edition; 2014.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

I. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

J. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

K. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.

L. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

M. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

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

O. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.

P. TIA-569 - Telecommunications Pathways and Spaces; 2019e.

Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

S. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

T. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

U. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

X. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Y. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

Z. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

AA. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

AB. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

AC. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or rigid PVC conduit.
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC) where emerging from underground.
5. Where rigid polyvinyl chloride (PVC) conduit is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, or PVC-coated galvanized steel rigid metal conduit (RMC) elbows for bends.
6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
7. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:
1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
2. Within Slab Above Ground: Not permitted.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or inside-plant flexible nonmetallic communications raceway/innerduct.

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit.
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
   1. Locations subject to severe physical damage include, but are not limited to:
      a. High traffic industrial and warehouse areas where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in industrial manufacturing areas.

L. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

M. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
   1. Exterior locations subject to severe physical damage include, but are not limited to:
      a. Where exposed to vehicular traffic below 20 feet.

N. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

O. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

P. Flexible Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Motorized equipment.

Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Provide conduit, fittings, supports, and accessories required for complete communications pathway.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Maximum Number of Communications Outlet Boxes per Continuous Conduit Homerun: Two.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 1-inch trade size.
   2. Continuous Conduit Homerun Serving One Communications Outlet Box: 1-inch trade size.
   3. Continuous Conduit Homerun Serving Two Communications Outlet Boxes: 1-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
   3. Material: Use steel or malleable iron.
      a. Where not subject to severe corrosive influence, stainless steel or aluminum fittings may be used.
      b. Do not use die cast zinc fittings.
   4. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
   5. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
   2. Gibson Stainless & Specialty, Inc: www.gibsonstainless.com/#sle.
   3. Patriot Industries, a division of Patriot Aluminum Products, LLC: www.patriotsas.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
   1. Material: Type 304 or 316 stainless steel.

C. Fittings:
   1. Manufacturers:
      a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
      b. Eaton: www.eaton.com/#sle.
      c. Gibson Stainless & Specialty, Inc: www.gibsonstainless.com/#sle.
      d. Patriot Industries, a division of Patriot Aluminum Products, LLC: www.patriotsas.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.

3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use stainless steel with corrosion resistance equivalent to conduit.
5. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
6. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
3. Material: Use steel or malleable iron.
   a. Where not subject to severe corrosive influence, stainless steel or aluminum fittings may be used.
   b. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
5. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
   a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Manufacturers:
   a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
   b. Eaton: www.eaton.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use stainless steel with corrosion resistance equivalent to conduit.
5. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
6. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.
   5. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.08 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
   2. Electri-Flex Company: www.electriflex.com/#sle.
   3. International Metal Hose: www.metalhose.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.09 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
   2. Electri-Flex Company: www.electriflex.com/#sle.
   3. International Metal Hose: www.metalhose.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.10 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
    a. ABB; T&B: www.electrification.us.abb.com/#sle.
    b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
    c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
    d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.
5. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.11 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
1. Material: Type 304 or 316 stainless steel.

C. Fittings:
1. Manufacturers:
    a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use stainless steel with corrosion resistance equivalent to conduit.
4. Connectors and Couplings: Use compression/gland or set-screw type.
5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.
6. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.12 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   1. ABB; Carlon: www.electrification.us.abb.com/#sle.
   2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
   3. Cantex Inc: www.cantexinc.com/#sle.
   4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
   5. JM Eagle: www.jmeagle.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
   3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.13 INSIDE-PLANT FLEXIBLE NONMETALLIC COMMUNICATIONS RACEWAY/INNERDUCT

A. Manufacturers:
   1. Eastern Wire + Conduit, a division of Atkore International: www.easternwire.com/#sle.
   2. Endot Industries: www.endot.com/#sle.
   3. Premier Conduit: www.premierconduit.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Flexible, corrugated, nonmetallic communications raceway and associated fittings listed and labeled as complying with UL 2024; also suitable for installation as innerduct.

C. Raceway Applications: Use listed plenum raceway unless otherwise indicated.

D. Use only with approved cables in accordance with listing.

E. Color: Orange, unless otherwise indicated.

2.14 ACCESSORIES

A. Inside-Plant Fabric Innerduct: Listed as complying with UL 2024; plenum rated.

B. Outside-Plant Fabric Innerduct: Designed for installation in underground raceways.

C. Outside-Plant HDPE Innerduct: Smooth interior wall; orange unless otherwise indicated.

D. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

E. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

F. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

G. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

H. Foam Conduit Sealant:
   1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Rated to hold minimum of 10 ft water head pressure.

I. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

J. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

K. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

L. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

M. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

N. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

O. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install galvanized steel intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

F. Install galvanized steel electrical metallic tubing (EMT) in accordance with NECA 101.

G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

H. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Communications rooms.
   c. Mechanical equipment rooms.
5. Unless otherwise approved, do not route exposed conduits:
   a. Across floors.
   b. Across roofs.
   c. Across top of parapet walls.
   d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than equivalent of two 90-degree bend(s) between pull points.
    a. The equivalent of three 90-degree bends between pull points is permitted only under conditions described in BICSI TDMM.
9. Arrange conduit to provide no more than 100 feet between pull points.
10. Arrange conduit to provide minimum bend radii in accordance with BICSI TDMM.
11. Route conduits above water and drain piping where possible.
12. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
13. Maintain recommended separation from sources of EMI greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.
14. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
15. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
16. Group parallel conduits in same area on common rack.

I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
2. Provide required seismic controls.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
6. Use metal channel/strut with accessory conduit clamps to support multiple, parallel, surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple, parallel, suspended conduits.
9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
10. Use of spring steel conduit clips for support of conduits is not permitted.
11. Use of wire for support of conduits is not permitted.
12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Terminate outside-plant entrance conduits at 4 inches above finished floor unless otherwise indicated.

7. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
8. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
9. Secure joints and connections to provide mechanical strength and electrical continuity.

K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

L. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
a. Underground, Exterior: 18 inches.
b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape along entire conduit length.
3. Provide copper conductor for use with toning location in conduit systems where only nonmetallic fiber optic cables are installed.

M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.
2. Install conduits within middle one third of slab thickness.
3. Secure conduits to prevent floating or movement during pouring of concrete.

N. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 3000.

O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

P. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
a. Where conduits enter building from outside.
b. Where service conduits enter building from underground distribution system.
c. Where conduits enter building from underground.
d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.
b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.

Q. Provide pull string in each empty conduit and innerduct/cell, and in each conduit where cables are to be installed by others. Leave minimum slack of 12 inches at each end.

R. Provide grounding and bonding.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

END OF SECTION

SECTION 28 4600

FIRE DETECTION AND ALARM

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 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.03 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Materials and methods for work to be performed by this installer.

B. Section 14 2100 - Electric Traction Elevators: Elevator systems monitored and controlled by fire alarm system.

C. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

D. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

E. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems: Requirements for the seismic qualification of equipment specified in this section.

1.04 REFERENCE STANDARDS

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

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

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 3 - Recommended Practice for Commissioning of Fire Protection and Life Safety Systems; 2015.

E. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing; 2015.

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

G. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Drawings must be prepared using AutoCAD Release 2002 or newer.

C. Evidence of designer qualifications.

D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction as well as compliance with contract documents, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Shop Drawings:

a. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A.14.6.2.4, and complete listing of software required.
b. System zone boundaries and interfaces to fire safety systems.
c. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.Plans shall show the addess for addessable devices.
d. Circuit and conduit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
    1) Calculation method shall be shown including wire size and values used.
    2) Calculation shall be Lump Sum at the end of the circuit or Point to Point. Load Centering shall not be used.
e. List of all devices on each signaling line circuit, with spare capacity indicated.

4. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
    a. Information to include: Model numbers, listing, ratings, and power requirements.
    b. Product cut sheets, calculations, certificates, etc. shall be submitted in a bound format or a single electronic document (such as PDF), shall be tabbed in a logical manner, and shall contain the information indicated.
    c. Voltage Drop Calculations - Duplicate on drawings
        1) Use methods specified in NFPA 72.
        2) Voltage drop calculations shall start at 85% of nominal voltage, i.e. a 24VDC system shall be calculated as starting at 20.4VDC.
        3) Circuit voltage not to drop below 16 VDC or the UL listed minimum voltage for device powered, whichever is higher.
        4) Device current to be based on UL listed minimum voltage.
        5) Circuit resistance shall include wire length out to last device and back to panel, including elevation changes.
        6) Calculation method shall be shown including wire size and values used.
        7) Calculation shall be Lump Sum at the end of the circuit or Point to Point. Load Centering shall not be used.
    d. Battery calculations - Duplicate on drawings
        1) Use methods specified in NFPA 72.
        2) A minimum 20% safety factor to the calculated Amp-Hours shall be provided.
5. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
6. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
7. Certification by Contractor that the system design complies with Contract Documents.
8. Do not show existing components to be removed.
9. Incomplete submittals or submittals that do not comply with these specifications may be rejected without a review.

E. Evidence of installer qualifications.

F. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.

4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

H. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

I. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.06 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   a. Demonstrated qualifications through written assessment of at least NICET level II, or AE approved equivalent. This includes individuals installing conduit, boxes, or wire for fire alarm devices.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
4. Contract maintenance office located within 100 miles of project site.
5. Certified in the State in which the Project is located as fire alarm installer.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories - Basis of Design: Simplex.

B. Fire Alarm Control Units and Accessories - Other Acceptable Manufacturers:

C. Initiating Devices and Notification Appliances:
   1. Simplex, a Tyco Business: www.simplex-fire.com.
   2. Same manufacturer as control units.

D. Substitutions: See Section 01 6000 - Product Requirements.
   1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
   2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Provide all labor to complete required work.
   3. Protected Premises: Entire building shown on drawings.
   4. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the State Fire Marshal.
      c. The requirements of the local authority having jurisdiction, which is Little Rock Fire Department.
      d. Applicable local codes.
      e. Contract Documents (drawings and specifications).
      f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   5. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
   6. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
   7. Program notification zones and voice messages as directed by Owner.
   8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
      a. This shall include, but not be limited to, all public restrooms, break rooms, exam rooms, fitting rooms, work rooms, conference rooms, open office areas, and corridors.
   9. Fire Command Center: Located in on-premises supervising station.
   10. Fire Alarm Control Unit: Existing, located at Security Office.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.
   2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at Security Office.
   3. Remote Supervising Station: UL-listed central station under contract to facility.
   4. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.
   5. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Circuits:
   1. Signaling Line Circuits (SLC) Within Single Building: Class A.
   2. Signaling Line Circuits (SLC) Between Buildings: Class A.
   3. Notification Appliance Circuits (NAC): Class A.

D. Spare Capacity:
   1. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Unless noted otherwise on the plans, power booster panels (NAC) shall not be fed from a separate notification power booster panel (daisy chained). Each NAC shall be triggered by a SLC circuit.

F. Guards for Protection of Components
   1. Description: Welded wire mesh or polycarbonate of size and shape for the manual station, smoke detector, strobe, or other device requiring protection.
      a. Factory fabricated and furnished by manufacturer of the device.
      b. Finish: Clear, or paint of color to match the protected device.
      c. Listed components of Safety Technology International Incorporated may be used with applicable de-ratings for strobes, horns, etc.

2.03 EXISTING COMPONENTS

A. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.

B. Clearly label components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves.
   2. Duct smoke detectors.
   3. Dry-pipe sprinkler system pressure.
   4. Dry-pipe sprinkler valve room low temperature.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.

C. Elevators:
   1. Heat detectors shall be used in elevator shafts and machine rooms to activate elevator shunt trip per NFPA 72 and ASTM A17.1.

D. HVAC:
   1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
   3. Provide legible, permanent labels for each addressable device, using address used in control panel.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
   2. Manual Pull Stations: Double Action.
      a. Provide 1 extra.
   3. Smoke Detectors: Photoelectric.
   4. Duct Smoke Detectors: Photoelectric.

E. Notification Appliances:
   1. Speaker/Strobes White Trim Clear Strobe.
      a. Selectable candela with candela visible when installed.
      b. Provide 1 extra.
   2. Strobes: White Trim Clear Strobe.
      a. Selectable candela with candela visible when installed.
      b. Provide 1 extra.

F. Conduit:
   1. Install all wiring in a conduit or raceway. Conduit fill shall not exceed 40 percent of the interior cross sectional area where three or more cables are included within a single conduit.
   2. Install conduit in accordance with the National Electrical Code, NFPA 70.
   3. Conduit shall be 3/4 inch minimum.
   4. Wiring for low voltage control, alarm notification, emergency communication, and similar power-limited auxiliary functions may be installed in the same conduit as initiating and signaling line circuits. Design system to permit simultaneous operation of all circuits without interference or loss of signals.
   5. Fire Alarm Conduit: All fire alarm wiring shall be in hot-galvanized electric metalic tubing colored RED from the factory.
      a. Junction covers shall be painted red and labeled "Fire Alarm".
      b. Fire alarm conduit shall have the wording "Fire Alarm" factory stamped onto each 10' section of conduit. If conduit is to be exposed in a finished area, see criteria below.
      c. If conduit is to be ran in an area with finished exposed ceiling spaces, consult with architect engineer for appropriate conduit and junction box color to match other equipment.
   6. Conduits shall not enter the control panel or any other component provided except where entry is specified by the manufacturer.

G. Wire:
   1. All fire alarm system wiring shall be new.
   2. Wiring shall comply with local, state, and national codes and as recommended by the manufacturer. Number and size of conductors shall be as recommended by the manufacturer, but shall be not less than 18 AWG for initiating device and signaling line circuits, and 16 AWG for notification appliance circuits.
   3. All wiring and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
   4. FPLP red cable shall be used for all interior fire alarm circuits including that in conduit.
   5. Any wire that goes underground, such as to PIV switches or to other buildings, shall be listed and approved for wet locations in accordance with NFPA 70.
   6. All field wiring shall be supervised for open circuits, short circuits, and grounded conditions.

H. Control Panel: Connected to a separate dedicated branch circuit with a separate dedicated disconnect switch; circuit labeled FIRE ALARM.

I. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

J. Wiring runs shall be tested for continuity, short circuits and grounds before any system devices are installed or energized.

K. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

L. Locks and Keys: Deliver keys to Owner.

M. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. The contractor is responsible for testing all components in accordance with the manufacturers required and suggested procedures and in accordance with NFPA 72. If this specification incorporates a detailed Acceptance Test Procedure (ATP) prepared by the engineer than it shall also be followed.

B. Every fire alarm system shall be pre-tested by the contractor prior to scheduleing any inspections by the architect engineer, owner, or local jurisdictions. Testing shall comply with this section and NFPA 72.

C. Notify Owner 7 days prior to beginning completion inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
   1. A signed Record of Completion shall be provided to the inspector prior to their inspection.

E. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

F. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

G. Provide all tools, software, and supplies required to accomplish inspection and testing.

H. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

I. All smoke detectors shall be tested using canned smoke, or other approved method that will functionally test the smoke chamber. The use of magnets to commission smoke detectors is strictly prohibited.

J. Smoke detectors shall not be installed until the construction cleanup of all trades is complete per NFPA 72 and this section.
   1. Orange shipping covers, rubber gloves, tape, or other devices shall not be used to try and get around these basic requirements.

2. Smoke detectors installed before the clean-up of all other dust or particle producing trades and without prior written approval of the engineer and local AHJ shall be replaced at the sole expense of the installing contractor.
3. AE reserves the right to permanantly and indelibly mark any detector installed this way.
4. Contractor is urged to use marked, temporary detectors for pre-testing of system and replace with new detectors prior to final testing.

K. All new smoke detectors that show to be "Dirty" through system sensitivity shall be replaced.

L. Audibility testing shall not be conducted until all doors, windows, walls, ceilings, and carpeting are in place. Final audibility testing that does not affect speaker placement should be done after space is fully furnished.

M. At a minimum the following tests shall be conducted, documented and given to AE at closeout:
1. Open initiating device circuits and verify that the trouble signal actuates.
2. Open and short signaling line circuits and verify that the trouble signal actuates.
3. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
4. Ground all circuits and verify response of trouble signals.
5. Check presence and audibility of tone throughout building spaces. This includes measuring dBA levels.
   a. A minimum of 15 dBA above ambient shall be obtained in every occupiable space (throughout) per NFPA 72. This includes storage rooms, electrical rooms, telephone rooms, and any other occupiable space.
6. Each of the alarm, trouble, or supervisory conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
7. Each notification circuit shall be tested under standby power. End-of-line voltage readings shall be taken at the end-of-line resistor for Class “B” circuits, or at the booster panel for Class “A” circuits. Circuit voltage drop shall be recorded and compared to calculated voltage drop. Note: Some systems incorporating synchronizing modules can impair results. If the module cannot be bypassed for voltage readings, the manufacturer should be contacted for guidance.
8. System off-site reporting shall be verified for alarm, supervisory, trouble, correct address, facility name, contact phone number, and contact name.
9. When the system is equipped with optional features or connected to external, non-fire devices, the manufacturer's manual should be consulted to determine the proper testing procedures.

N. The commissioning inspector shall use the system record drawings and other documents specified under this specification during the testing procedure to verify operation as programmed. In conducting the commissioning test, the inspector shall request demonstration of any or all input and output functions.

O. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

P. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
1. Record all system operations and malfunctions.
2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
3. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
1. Hands-On Instruction: On-site, using operational system.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 31 1100
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Clearing and grubbing site and street right-of-way.

B. Disposing of removed material

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

1.03 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

A. No Products included

PART 3 EXECUTION

3.01 SITE PREPARATION & PROTECTION

A. Protection of Existing Improvements.

1. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
2. Protect improvements on adjoining properties.
3. Restore damaged improvements to their original condition, as acceptable to Architect/Engineer or other parties having jurisdiction.

B. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation, indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bank, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in manner acceptable to the Architect/Engineer. Employ qualified tree surgeon/arborist to repair damage to trees and shrubs.

3.02 SITE CLEARING

A. General: clear construction areas of trees, vegetation, improvements, debris, or other obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Tree removals include the removal of root balls and roots.

B. Removal of Improvements: Remove above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

C. Abandonment or removal of certain underground pipe or conduits may be shown on mechanical or electrical drawings, and is included under work of this section. Removal of all other abandoned underground piping or conduit interfering with construction is included under this section.

3.03 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted on Owner’s property.

B. Remove cleared waste materials from Owner's property and dispose of at an off site location secured by the contractor.

END OF SECTION

SECTION 31 2000

EARTH MOVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Stripping and stockpiling surface layer of topsoil and organic matter in building and traffic areas and in all cut and fill areas.

B. Removing and disposing of material unsuitable for use in controlled fill.

C. Excavating site to required subgrade for controlled fill and grading site to required slopes.

D. Placing and compacting excavated material and borrow material to required density and at required subgrade and slope for structures, pavement areas, and other controlled fills.

1.02 RELATED WORK

A. Section 31 2216 – Fine Grading.

B. Section 33 0516 – Manholes and Structure.

1.03 REFERENCE STANDARDS

A. ASTM D422 – Particle Size Analysis of Soils.

B. ASTM D4318 – Test for Liquid Limit of Soils.

C. ASTM D4318 – Test for Plastic Limit of Soils.

D. ASTM D2216 – Method of Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

E. ASTM D3017 – Moisture Content on Soil Aggregates in Place by Nuclear Methods (Shallow Depth).

F. ASTM D698 – Standard Test Method for Moisture Density, Relations of Soils, and Soil Aggregate Mixtures Using 5.5 lb Rammer and 12” Drop.

G. ASTM D1557 – Standard Test Methods for Moisture Density Relations of Soils and Soil Aggregate Using 10 lb. Rammer and 18” Drop.

H. ASTM D2922 – Density of Soil and Soil Aggregates in Place by Nuclear Method (Shallow Depth).

1.04 SUBMITTALS

A. See Related Work

1.05 SITE CONDITIONS

A. Establish positive surface drainage during and following clearing and grading activities using proper ditching and sloping methods.

B. Provide erosion control measures to prevent mud and slit from flowing onto adjacent property.

C. Erect sheeting, shoring, and bracing as necessary for protection of persons, utilities improvements, and excavations.

PART 2 PRODUCTS

2.01 SUITABLE MATERAILS FOR CONTROLLED FILL

A. On site excavated soils:

1. Unified Soils Classification Systems Soils.
    a. Class SC
    b. Class GC
    c. Class CL

2. Soils having Liquid Limit of less than 45, Plasticity Index (PI) of 20 or less.
3. Other soils approved by the Engineer.

B. Borrow Material:
1. Soils meeting the requirements of sub-paragraph A.1 of this Article.

C. Material meeting the requirements of selected material as described in Section 210 of the Arkansas State Highway Department's Standards Specifications for Highway Construction, Edition of 2003.

2.02 UNSUITABLE MATERIAL FOR CONTROLLED FILL

A. All areas: Organic top soils, soils containing roots, vegetable matter, or trash, and silts (ML) and clays (CH), and cobbles and fractured rock more than 3 inches in greatest dimension.

PART 3 EXECUTION

3.01 SUBSURFACE INVESTIGATION

A. The Contractor is responsible for having a thorough knowledge of all Drawings, Specifications, General and Supplementary Conditions, existing site conditions, and other Contract Documents. Failure to acquaint himself with this knowledge does not relieve him of the responsibility for performing his work in a manner acceptable to the Owner. No additional compensation will be allowed because of conditions that occur due to failure by the Contractor to familiarize himself and all workers with this knowledge.

B. Protection of Existing Trees and Vegetation:
1. Protect existing trees and other vegetation, indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bank, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in manner acceptable to the Architect/Engineer. Employ qualified tree surgeon to repair damage to trees and shrubs.

3.02 PREPARATION

A. Complete clearing work, removing visible unsuitable materials from site.

B. Protect benchmarks, site corner pins and existing street paving from damage by equipment.

C. Stake the work:

D. Before starting the excavation, establish location and extent of underground utilities occurring in work area.

E. Notify utility companies of lines which are in the way of excavation.

F. Protect existing utility lines to remain which pass through the work area.

G. Protect utility services uncovered by excavation.

H. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

I. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

3.03 EXCAVATION PROCEDURES

A. Excavation General:

1. Strip topsoil in cut and fill areas to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove and dispose of heavy growth of grass and surface debris from areas prior to stripping topsoil.
    a. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
2. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.
3. Remove soft or spongy material at the exposed sub-grade of cut and fill areas and replace with approved material and compact.
4. Use all suitable excavated material, as far as practicable, in the formation of controlled fills and fill slopes.
5. Keep all excavations dry by pumping or draining water from the Work.
6. In cut areas where fill is not required proof roll the areas with a loaded tandem axle dump truck or similar equipment to aid in identifying soft areas. Remove soft soils and replace with controlled fill. Scarify exposed sub-grade soils to a depth of at least 8 inches, adjust the soil mixture, and recompact to the same density as required for each layer of controlled fill.
7. Grade excavated slopes to a neat, smooth condition with no loose material or scars left on the surface.
8. Dispose of debris, excess topsoil, excess fill material and unsuitable material at an off site location secured by the contractor.

3.04 CONTROLLED FILL

A. After excavation and before fill placement, proof roll fill areas with a loaded tandem axle dump truck or similar equipment to aid in identifying soft areas. Remove soft areas and replace with controlled fill.

B. Scarify cleared surface in fill areas to a depth of at least 8 inches, adjust the soil mixture, and recompact to the same density as required for each layer of controlled fill.

C. Place fill material in lifts no greater than 8-inch loose-lift uniform thickness and compact to 95% MAX Dry Density as determined by the Modified Proctor Test, ASTM D1557.

1. Aerate material when too wet by manipulation with suitable equipment before compacting.
2. Add water when soil is too dry and mix with the material before compacting.

D. Complete excavation and controlled fill elevations to match finish grade, less the depth of topsoil specified for sodded and seeded areas in the landscape plan.

3.05 FIELD QUALITY CONTROL

A. Field density tests will be performed per ASTM D6938.

B. Frequency of Tests:

1. Tests shall be made every day fill is being placed and representative lifts tested.
2. At least one test per 2,500 sq. ft. under buildings and structural areas.
3. At least one test per 5,000 sq. ft. under paved areas.
4. At least one test per 10,000 sq. ft. in general areas.
5. Contractor to notify engineer when fill work is in progress.
6. Test locations will be selected at random by engineer with an effort made to select areas of questionable compaction.

7. Retesting required because of nonconformance to specified requirements shall be performed by the same agency on instruction from the engineer.
8. Retesting required because of nonconformance to specified requirements shall be paid for by the contractor. Payment for retesting or re-inspection will be charged to the contractor by deducting testing charges from the contact sum/price.

END OF SECTION

SECTION 31 2100
SITE PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Utilities.
   2. Existing Improvements.
   3. Protection of Existing Trees.
   4. Clearing and Grubbing
   5. Disposal of Waste Materials
   6. Maintenance of Traffic

1.02 RELATED SECTIONS

A. ALL SECTIONS

1.03 GENERAL

A. The Contractor shall clear a construction right-of-way as narrow as possible and avoid unnecessary removal or damage to the trees, shrubs, and other landscaping.

B. The Contractor shall not remove or disturb any vegetation except that required for the execution of the work, or as shown in the plans. The Contractor shall limit all his operations to the areas of the permanent and temporary easements; therefore, any/all damage to vegetation done by the Contractor outside these areas shall be repaired at his own expense and to the satisfaction of the Owner and the affected property owner.

C. Where the presence of livestock, pets or other conditions exist that require continuous confinement, the Contractor shall construct temporary fencing adequate to contain such livestock, etc.

D. The area of construction shall be kept clean and well maintained with special emphasis given to the area of lawns and maintained grass areas. Construction debris, paper, trash, and other items shall be picked up at the end of each day's construction work. Restoration work shall be done each day as the applicable sewer main work is completed to the extent that driveways, access roads, etc. are usable. Whether temporary or permanent, the daily restoration work shall be approved by the Owner.

1.04 PROJECT CONDITIONS:

A. Authority for performing removal and alteration work on property adjoining permanent or temporary construction easements, or properties to which the Owner has no legal rights, will be obtained by Contractor prior to beginning work.

1.05 EXISTING SERVICES

A. Indicated locations are approximate; determine exact locations before beginning work.

B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.

C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Before beginning clearing and grubbing operations, call the Arkansas One-Call system at 1-800-482-8998 and/or the utility owner (if not a member of the One-Call service). Allow at least two working days advance notification.

3.02 MAINTENANCE OF TRAFFIC

A. This item shall include the erection of signs, barricades, temporary markings, and the maintenance of, or noninterference with traffic in accordance with an approved Plan submitted by the Contractor. This item shall also include the temporary relocation of traffic and street signs, the maintenance of the temporarily relocated signs through the construction of the project, and the permanent relocation of any sign relocated due to construction signage after the construction is complete.

SUBMITTALS

a. The Contractor shall submit for approval a traffic maintenance plan to the Owners Representative prior to any work. This plan must contain the methods proposed by the Contractor to maintain safety for both construction personnel and the traveling public.
b. Once approved, the Contractor shall supply the Fire Chief and the Police Chief one (1) copy each for their files. Two (2) copies shall be supplied to the Owners Representative.

PRODUCTS & MATERIALS

a. All materials must be in accordance with the latest version of the MUTCD.

EXECUTION

a. The Contractor shall implement and maintain all maintenance of traffic devices as shown in his approved Plan. The Contractor shall submit his own Plan to the Owner and Engineer for review and approval.
b. The Contractor shall initiate and maintain all necessary labor and materials necessary to construct the project in a manner which will guarantee public safety with a minimum of inconvenience. Additional work shall be performed by the Contractor during construction as directed by the Owner or Engineer if necessary to insure the above standards.
c. The Contractor shall designate a traffic control supervisor to furnish continuous surveillance over traffic control operations. This supervisor shall be available at night and weekends to respond to calls involving traffic control. The name of the traffic control supervisor shall be provided at the preconstruction conference and to local police.
d. The Contractor’s personnel who are used to maintain traffic flow, such as flagmen or any other person who verbally communicates with or gives directions to the motorized public, shall speak English fluently.
e. If the Owner or the Engineer determines that provisions for safe traffic control are not being provided or maintained, the work will be suspended. In cases of serious or willful disregard for safety of the public or construction workers, the Owner will place the traffic control devices in proper condition and deduct the costs from monies due the Contractor.

3.03 UTILITIES

A. The location and/or elevation of existing utilities as shown on the Drawings is based on

documents provided by others. The information is not to be relied on as being exact or complete. Call the Arkansas One-Call system at 1-800-482-8998 and/or the utility owner (if not a member of the One-Call service), at least two working days before any excavation to request exact field location of utilities.

B. Protect utilities encountered during excavation.

C. All existing water or sewer services are to remain active until the new lines are put into service. If an existing service line interferes with the installation of a new water or sewer line such that the planned grade and alignment of the new line cannot be met, as determined by the Owner, the Contractor shall provide a temporary service line for the continuation of service. At the beginning of this project, in advance of any construction, the Contractor shall coordinate with the Owner and the Engineer to establish routes of temporary service lines. Connection of the temporary service lines to existing lines shall also be coordinated such that shutdown time of the existing service will be minimal.

D. All temporary service lines, fittings, and appurtenances shall be constructed of materials approved by the Owner and shall be of sufficient length and location to permit installation of the new service line. Temporary lines may be routed through existing driveway culverts if approved by the Owner. All temporary service lines shall be maintained in safe and operational condition until the new service line enters service. All other aspects of materials and construction of temporary service lines, including cutting, plugging and blocking the existing lines, shall conform to the plans and specifications pertaining to the permanent service lines for this project.

E. After the new service line enters service, all piping materials and valves, fittings, etc. used for temporary service lines shall be removed and shall remain the property of the Contractor. All open trenches shall be properly backfilled and compacted as approved by the Engineer.

F. If utilities are damaged or utility service is interrupted by work under this section, the utility owner has the first right to repair. If public health or safety is at risk, Contractor shall take appropriate, prudent action to repair damage and service interruption. Costs of utility protection and repair shall be borne by the Contractor.

G. If existing utilities are found to interfere with the permanent facility being constructed, notify the Engineer for instructions.

H. Do not proceed with permanent relocation of utilities without written instructions from the Engineer.

3.04 PROTECTION OF EXISTING TREES

A. Trees, shrubs, or other items located in or adjacent to maintained yards shall not be removed or damaged by the Contractor without specific authorization from the Owner for each item. The Contractor shall remove from the area and properly dispose of all trees, stumps, limbs, piles of excess excavation, or any other items removed so as to allow construction.

B. Protect trees designated to remain.

C. Erect suitable barrier around trees, as approved by Engineer.

D. Do not allow heavy pedestrian or <u>any</u> vehicular traffic over root zone of trees to be saved.

E. Do not place construction materials or stockpiles within the tree drip line.

F. Water trees and other vegetation indicated to remain, or as directed by Engineer, as required to maintain their health during course of construction operations.

G. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

H. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to the Engineer. Employ a licensed arborist to repair damage to trees and shrubs.

I. Replace trees that cannot be repaired and restored to full-growth status, as determined by Owner's Landscape Administrator.

3.05 CLEARING AND GRUBBING

A. After tree protection barricades are installed, remove all trees, shrubs, grass, or other vegetation, improvements, and obstructions that interfere with new construction unless otherwise indicated on the drawings.
B. Completely remove stump, roots, and other debris protruding through ground surface.
C. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
D. Use only hand methods for grubbing inside drip line of trees indicated to remain.
E. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
F. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
G. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

3.06 DISPOSAL OF WASTE MATERIALS

A. Burning of material shall only be done when allowed by local authorities.
B. When allowed, the burning shall be done in accordance with all applicable local, state, and federal regulations.
C. When perishable material is burned, it shall be under the constant care of a competent watcher.
D. Burning shall be accomplished at such times and in such manner that the surrounding vegetation, adjacent property, or anything designated to remain on the project site will not be jeopardized.
E. Contractor shall cease all burning operations when Federal, State, or local government agencies declare that meteorological conditions are unsuitable for burning. Contractor may resume burning operations when conditions are again suitable for burning.
F. Unless allowed otherwise by regulatory authorities, materials to be burned shall be placed in an incineration pit and an acceptable forced air device shall be used to minimize the emission of smoke, fly ash, or other pollutants. This device shall be constructed so that the forced air is directed over the fire by the use of plenums or ducts. Open fans or mulch blowers are not acceptable and will not be allowed for burning operations.
G. Contractor shall comply with all Federal, State, County, and local laws, regulations, or ordinances applicable to the disposal of clearing and grubbing material. Under no circumstances will the airborne emission of live sparks or burning debris be allowed from the burning operations.
H. Materials and debris that cannot be burned shall be removed from the construction limits and disposed of offsite in an approved repository. Any extra costs incurred by Contractor in obtaining disposal sites, hauling, and final cleanup will be at Contractor's expense.

END OF SECTION

SECTION 31 2216
FINE GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Stripping and stockpiling surface layer of topsoil and organic matter in all cut and fill areas.

B. Excavating and grading open drainage ditches.

C. Placing and compacting excavated material or borrow material to required density and at required subgrade and slope for roadway embankment and other compacted fills.

D. Removing and disposing of excess excavated material.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 33 0516 – Manholes and Structure.

1.03 SUBMITTALS

A. See Related Work

1.04 SITE CONDITIONS

A. Establish positive surface drainage during and following stripping, embankment construction, and roadway grading by proper ditching or slopping.

B. Provide measures to prevent mud and silt from flowing onto adjacent property.

C. Erect sheeting, shoring, and branching as necessary for protection of persons, improvements, and excavations.

PART 2 PRODUCTS

2.01 SUITABLE MATERIAL FOR COMPACTED EMBANKMENT

A. On site excavated soils:

1. Unified Soils Classification Systems Soils.
    a. Class SC
    b. Class GC
    c. Class CL
2. Soils having Liquid Limit of less than 45, Plasticity Index (PI) of 20 or less.
3. Other soils approved by the Engineer.

B. Borrow Material:

1. Soils meeting the requirements of sub-paragraph A.1 of this Article.

C. Material meeting the requirements of selected material as described in Section 210 of the Arkansas State Highway Department's Standards Specifications for Highway Construction, Edition of 2014.

2.02 UNSUITABLE MATERIAL FOR COMPACTED EMBANKMENT

A. All areas: Organic topsoil's, soils containing roots, vegetable matter, or trash, and cobbles and fractured rock more than 3 inches in greatest dimension.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove visible unsuitable materials from the site before beginning stripping and site grading operation.

B. Notify Architect/Engineer when work is ready to be staked.

C. Notify the geotechnical engineer representing the Owner's selected testing laboratory at least 48 hours before planned time to begin placing embankment material.

3.02 EXCAVATION PROCEDURES

A. Excavation, General:

1. Strip topsoil in cut and fill areas to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove and dispose of heavy growth of grass and surface debris from areas prior to stripping topsoil.
2. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
3. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.
4. Remove soft or spongy material at the exposed sub-grade of cut and fill areas and replace with approved material and compact.
5. Use all suitable excavated material, as far as practicable, in the formation of controlled fills and fill slopes.
6. Keep all excavations dry by pumping or draining water from the work site.
7. Grade excavated slopes to a neat, smooth condition with no loose material or scars left on the surface.
8. Protect existing asphalt paving and structures designed to remain from drainage by excavation and grading operations.
9. Dispose of debris, excess topsoil, excess fill material and unsuitable material at an off-site location secured by the contractor.

B. Excavation, roadway:

1. Excavate and grade to within ±0.1 foot of required subgrade elevations.
2. Grade back slopes to the slope shown on the Drawings.
3. Remove soft or spongy material at the exposed subgrade of cut and fill areas and replace with select material and compact to the same density as required for compacted fill. Identify soft areas by proof rolling with a loaded tandem axle dump truck or similar equipment.
4. DO not allow subsoil in roadbed area to become saturated. Maintain positive surface drainage during and following excavation, grading, and filling operations.
5. Where compacted fill is required, scarify stripped surface to a depth of at least 8 inches, adjust the soil moisture, and recompact to the same density as required for each layer of compacted fill.

3.03 COMPACTED EMBANKMENT

A. Start embankment full width of bottom of embankment cross-section and construct to specified grade over full width in uniform layers.

B. Place fill material in lifts no greater than 8 inch loose-lift uniform thickness and compact to a minimum of 95% of maximum dry density at or near optimum moisture content as determined by the Modified Compaction Procedures, ASTM D1557.

1. Add Water when soil is too dry and mix the material before compacting.
2. Aerate material when too wet by manipulation with suitable equipment before compacting.

C. Do not place next lift until the in-place density and moisture content of the preceding lift has been verified.

D. Geotechnical engineer will inspect and test soil for suitability for use in embankment and for need to perform additional "Proctors" as soil composition changes during progress of excavation. Do not compact layer of soil that geotechnical engineer has determined to be a

"change in soil composition" until it has been determined to be suitable and a "Proctor" has been run.

E. Coordinate with the geotechnical engineer and provide the necessary assistance to perform the tests. Initial soil testing costs shall be paid for as outlined in the testing specification of the front-end documents. Should the tests be unsatisfactory, the Contractor shall be responsible for obtaining and paying for additional tests, which will be performed by an independent laboratory approved by Owner and Engineer.

F. Maintain stability of compacted embankment. Replace or repair portions which have eroded due to elements or to Contractor negligence.

G. Grade for slopes and other embankment areas not to be paved, to neat, smooth conditions with no loose material or scars left on surface. Fill and grade slopes to within three inches of finish grade elevations to allow for topsoil, sod and other landscaping.

3.04 PROTECTION

A. As soon as embankment is completed, proceed with riprap work and notify architect/Engineer that slopes are ready for erosion protection by landscaping contractor.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavating rock encountered during trenching for utility lines and excavating for manholes by mechanical methods. Blasting is not allowed.

B. Disposing of excavated rock material.

1.02 RELATED WORK

A. Section 33 1100 – Water Utility Distribution Piping.

B. Section 33 3100 – Sanitary Utility Sewerage Piping.

C. Section 33 3900 - Sanitary Utility Sewerage Structures.

D. Section 33 0516 – Manholes and Structures.

1.03 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 MATERIALS

A. Definition of rock: All solid rock formation that, in the opinion of the Engineer, cannot be excavated by using power shovels or other power excavators which are of recognized manufacture and design, of adequate size and operated by qualified operators without continuous and systematic blasting, barring or wedging. It shall include boulders or pieces of detached rock exceeding one cubic yard in volume and solid rock formations which are interspersed with strata of clay or other material provided however that the solid rock constitutes at least 75% of the total volume of the particular formation. The conventional heavy-duty excavating equipment may be defined as a Caterpillar D-6 bulldozer with single tooth ripper, a Caterpillar 325 track excavator equipped with a single tooth ripper and rock teeth, or equipment of similar power and capability. Rock excavation volumes should be determined based on in-place measurements via cross sectioning. If excavation is to be unclassified, the contractor must be responsible for assessing rock excavation requirements.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify site conditions and note irregularities affecting work of this section.

B. Beginning work of this section means acceptance of existing condition.

3.02 ROCK EXCAVATION – GENERAL

A. Excavate rock encountered in excavating for manholes and trenching for water and sewer lines.

B. De-watering: Provide temporary adequate de-watering equipment to keep excavations free of standing water during rock excavation.

3.03 ROCK EXCAVATION – MECHANICAL METHOD

A. Excavate for and remove rock by the mechanical method.

B. Cut away rock at excavation bottom to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for subgrade levels.

D. Remove Excavated Material from Site.

END OF SECTION

SECTION 31 2500

EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work shall consist of temporary erosion control measures needed to control erosion and water pollution, through the use of berms, sediments basins, sediments dams, silt fences, silt dikes, and temporary seeding.

B. Temporary erosion control measures shall be performed promptly when problems occur or when potential problems are anticipated in certain areas in order to minimize soil erosion. The temporary erosion control measures shall be properly maintained until permanent erosion control features are functioning properly.

C. The Contractor shall comply with all Federal, State, and Local laws and regulations controlling pollutions of the environments. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds and reservoirs with fuel, oils, bitumens, chemicals, soil sedimentation or other harmful materials and to prevent pollution of the atmosphere from particulate gaseous matter.

1.02 RELATED WORK

A. Section 31 1100 –Clearing and Grubbing

B. Section 31 2000 – Earth Moving

1.03 SUBMITTALS

A. See Related work.

1.04 QUALITY ASSURANCE

A. Prior to start of the construction, the Contractor shall submit, to the Owner and Engineer, his schedule for temporary and permanent erosion control work based on the Engineer's erosion control base plan, as is applicable for clearing & grubbing, grading and trenching. The location of the project, type of soil, topography and proximity to watercourses shall be considered when imposing such limitations.

PART 2 PRODUCTS

2.01 FILTER FABRIC

A. The filter fabric for silt fence shall be as indicated on the drawings.

PART 3 EXECUTION

3.01 PERMITTING

A. The Contractor shall file the Notice of intent to discharge storm water associated with the planned construction activity in accordance with the State of Arkansas NPSES General Permit ARR10A000 48 hours before starting construction. The Contractor shall develop a Storm Water Pollution Prevention Plan (SWPPP) document for submittal to ADEQ.

B. The Contractor shall be responsible for preparing all required permit applications and payment of all permitting fees as may be necessary for this project.

3.02 EROSION CONTROL

A. The Contractor shall schedule and conduct his operations in such a manner as to insure good erosion control practices so as to minimize soil erosion and prevent the contamination of and depositing of sediment in adjacent streams or other water courses, lakes, ponds, and other areas of water impoundment. Temporary erosion control measures which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with clearing & grubbing, grading, and trenching operations.

B. Permanent erosion control devices or measures shall consist of culvert pipe, terraces, gutters, bituminous curb, sectional drains, permanent slope drains, and the establishment of permanent vegetation (seeding), and when included in the contract they shall be incorporated in the construction with the least delay. Trenched areas shall be seeded as the excavation proceeds to the extent considered necessary by the Engineer as desirable or practicable.

C. The Contractor shall also conform to the following practices and controls:

1. When the material is trenched, erosion of the slopes shall be controlled both during and after completion of the work, that erosion will be minimized, and sediment will not enter streams, wetlands or other bodies of water. Haul roads shall be located and constructed in a manner that will keep sediment from entering streams.
2. Pollutants such as fuels, lubricants, bitumens, raw sewage and other harmful materials shall not be discharged into or near rivers, streams or impoundments or into natural or manmade channels leading thereto. Wash water or waste from concrete mixing operation shall not be allowed to enter live streams.
3. All applicable regulations of agencies and statutes relating to the prevention and abatement of pollution shall be complied within the performance of the contract.
4. Dust Control:
    a. Implement dust control methods to control dust creation and movement on construction sites and roads and to prevent airborne sediment from reaching receiving streams or storm water conveyance systems, to reduce on-site and off-site damage, to prevent health hazards, and improve traffic safety.
    b. Control blowing dust by suing one or more of the following methods:
        1. Mulches bound with chemical binders.
        2. Temporary vegetative cover.
        3. Spray-on adhesives on mineral soils when not used by traffic.
        4. Tillage to roughen surface and bring clods to surface.
        5. Irrigation by water sprinkling.
        6. Barriers using solid board fences, snow fences, burlap fences, crate walls, bales of hay, or similar material.
    c. Implement dust control methods immediately when dust is observed blowing on Site.

D. All temporary erosion and sediment control structures shall be constructed in accordance with the Storm Water Pollution Prevention Plan. All temporary structures shall be maintained in proper operating condition during the construction period. The temporary structures shall be removed, and the site cleaned up only after the end of the construction activity and the seeding and fertilizing operation has been completed and the grass has been established.

E. The contractor shall follow the general guidelines for placement of erosion and sediment control as indicated on the Erosion Control Plan as part of his SWPPP. The Contractor shall add any required additional erosion and/or sediment control devices as necessary to control erosion and sediment on the project site. The contractor shall use the Engineer's erosion control plan to comply with the SWPPP and it shall include as a minimum the following items:

1. Time scheduling for the various phases of the work designed to limit the time between the clearing and the temporary seeding and fertilizing to a reasonable period of time.
2. Temporary erosion control measures shall be included in the plan in accordance with the temporary erosion control details as included on the Erosion Control Plan.

3. A time schedule shall be included in the plan detailing when each erosion control structure shown on the plans is to be constructed. Each structure should be constructed as soon as practical after access to the site has been achieved and prior to major grading operations.
4. Temporary erosion control structures shall be maintained to function satisfactorily and all sediment and debris removed and disposed of in a manner acceptable to the Engineer.

3.03 INSPECTION

A. The Contractor shall appoint a qualified person(s) to conduct regularly scheduled inspections during his contract. Inspections shall be conducted, with a minimum frequency of every seven (7) calendar days or within 24 hours following the end of at least a 0.5-inch (1/2 inch) rainfall event, whichever is earliest. During the inspection, the following areas (as a minimum) will be inspected:
   1. Disturbed Areas – All areas of disturbed soil i.e., bare soil with no ground cover shall be inspected for signs of washing and erosion.
   2. Material Storage Area – All central storage areas where materials/chemicals are stored for signs of spill, leaks and possible contamination.
   3. Erosion and Sediment Control Measures – Inspect all erosion and sediment control measures for signs of wear, damage, remaining capacity level, usefulness, etc.
   4. Discharge Locations – Immediately following, and possibly during a significant rainfall event, inspect all discharge locations to ascertain the effectiveness of the control measures.
   5. Entrance/Exit Locations –Inspect all exit points from the site for evidence of vehicle tracking.

B. The inspector shall complete an inspection form for each inspection performed. As a minimum, the inspection form shall contain the following information:
   1. Name and location of project.
   2. Name and title of the inspector.
   3. Date and time of the inspection.
   4. Condition of each of the above locations.

3.04 MAINTENANCE OF ROADWAYS

A. The existing paved roadways adjacent to the permitted entrance locations shall be maintained in a clean and passable condition by the Contractor. When required or as requested by the Owner of the Engineer, the Contractor shall broom or wash the existing paved roadways to remove excess mud or dirt at the intersection and for a reasonable length of the existing roadway beyond the intersection. The work shall not be paid for directly but shall be considered incidental to the other items of work and the cost included as a part of the work.

3.05 PAYMENT

A. Payment for the work in this section shall be included as part of the lump sum contract.

END OF SECTION

SECTION 31 4000

SHEETING AND SHORED EXCAVATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Work under this Section consists of furnishing, placing, maintaining and subsequently removing, to the extent required, a positive system of temporary supports for cut and cover, open cut, and trench excavations, including bracing, dewatering, and associated items to support the sides and ends of the excavations. The support system shall prevent lateral and vertical ground movements which will cause damage to buildings, structures, pavements, utilities, and any other adjacent improvements.

B. The excavations for the structures shall be made vertical and shored according to this Section. The Contractor shall construct sheeting and shoring to construct all structures and protect all existing structures, improvements, aboveground utilities, and below-ground utilities.

C. Contractor shall make his own assessment of existing conditions including adjacent property, the possible effects of his proposed temporary works and construction methods, and shall select and design such support systems, methods, and details as will assure safety to the public, adjacent property, and the completed Work.

D. The positive system of support may consist of soldier piles and lagging, sheet piling, or other methods as may be approved by Engineer; secured in place by means of bracing members which may include wales, struts, tieback anchors, or similar members. A trench box is not considered a positive means of support and will not be permitted.

E. Utility modification or relocation shall be performed by Contractor at no additional cost to Owner or Engineer, if existing utilities interfere with Contractor's proposed method of support.

F. Related Work Specified Elsewhere:

Earthwork ……Section 31 2000

Trench Excavation and Backfill …… …….Section 31 2316

1.02 QUALITY ASSURANCE

A. Reference Standards and Specifications:

1. American Society for Testing and Materials (ASTM):

ASTM A36/A36M - Carbon Structural Steel.

ASTM A328/A328M - Steel Sheet Piling.

2. American Welding Society (AWS): D1.1 - Structural Welding Code, Steel.

3. American Institute of Steel Construction (AISC): Manual of Steel Construction.

1.03 SUBMITTALS AND CONSTRUCTION RECORDS

A. Submittals:

1. Submit as specified in Section 1330.

2. Preliminary Shoring Report:

a. A Preliminary Shoring Report outlining the entire scope of the Contract shoring to the specified requirements shall be prepared by or under supervision of Contractor's shoring engineer. The Preliminary Shoring Report shall be submitted for Owner and Engineer review in accordance with Section 1330 prior to the commencement of any shoring work.

3. Working Drawings:

a. Working drawings, by a licensed professional engineer, shall be submitted for Owner and Engineer review in accordance with Section 1330 prior to the commencement of work on each individual item of shoring.

b. The following shall be included on the working drawings:

1. Details, arrangement, and method of assembly of the proposed system.
2. The method of bracing and preloading.
3. The full excavation depth.
4. Loads for various stages of bracing removal during concrete placement and backfilling.
5. The anticipated lateral earth pressure, hydrostatic pressure, utility, rail, traffic, and equipment loads.
6. The maximum design load to be carried by the various members of the support system and a tabulation of the required preloads.
7. The depth to which the support system will be installed.
8. The proposed sequence of strut and shore removal as applicable and as related to concrete placement and backfilling operations.
9. Proposed monitoring plan, including location of monitoring points, inclinometers, and seismographs.

c. Complete design calculations and the maximum theoretical deflections of the support members shall be included.

d. Existing utility facilities shall be included and, after checking their locations by field investigations, the working drawings shall be revised to show the actual locations of facilities, location of excavation supports, interference with the proposed Work, and how Contractor proposes to overcome these interferences.

e. Documents provided with evidence of an Arizona State registered Professional Engineer's seal, signature, and date.

f. Welder certificates signed by Contractor certifying that welders comply with requirements under "Quality Assurance" Article.

g. Qualifications of vibration monitoring firm.

B. Construction Records:

1. The summary of monitoring data prepared by Contractor's shoring engineer shall be submitted for Owner and Engineer review on a weekly basis.
2. Results of pre-excavation survey prior to any excavation.

1.04 QUALIFICATIONS

A. Contractor and his subcontracted shoring engineer shall furnish evidence of having successfully completed one project that meets the following criteria:

1. Equal or larger total linear footage of sheeting or shoring for one project of similar scope and conditions.
2. Complete within the specified contract time.

1.05 DEWATERING

A. Dewatering plan shall be based on the criteria specified in Section

1.06 PROTECTION

A. Sheeting and Shoring: Provide shoring, sheeting, and bracing as indicated or required. Meet the following requirements:

1. Prevent undermining of pavements and slabs. Remove and replace all undermined pavements, either concrete or asphalt, at Contractor's expense.
2. Excavations shall be accomplished with vertical banks wherever possible. All excavations shall remain within the property lines of the pump station as shown on the Drawings.
3. Except as otherwise specified herein, shoring and sheeting materials may be extracted and reused at Contractor's option; however, Contractor shall remove and replace any existing structure or utility damaged during shoring and sheeting. Where shoring and sheeting materials must be left in place in the completed Work to prevent settlements or damage to adjacent structures or as directed, backfill the excavation to 1 meter (3 feet) below the finished grade and remove the remaining exposed portion of the shoring before completing the backfill. If H-piles and wood lagging are used for shoring, remove wood lagging to within 1 meter (3 feet) of finished grade in incremental steps of approximately 150 mm (6 inches) as the backfill is constructed. The location of all shoring and sheeting left in place shall be documented on drawings and given to Engineer and Owner.

1.07 QUALITY ASSURANCE

A. Design Criteria:

1. The design and construction of the support system, and the adequacy thereof, shall be the responsibility of Contractor. Contractor's shoring engineer shall be a professional engineer, legally authorized to practice in the jurisdiction where the Project is located, experienced in the design of earth support systems, and required to visit the Site prior to development of any sheeting and shoring system designs in order to become familiar with existing Site conditions.
2. During installation and removal of the any shoring, Contractor's shoring engineer shall visit the Site to observe the Work and to verify the compatibility of the Work with design assumptions. Contractor's shoring engineer shall prepare a status report with each visit to the Site. This report shall be submitted to Engineer within three days of each Site visit. This status report shall contain certification that the Work is in concurrence with design assumptions. If deficiencies are observed, these must be noted and the corrective action outlined in the report. In the event that deficiencies are noted in Contractor's shoring engineer's report, Contractor's shoring engineer shall return to the Site within three days after the corrective action has begun to verify that the deficiencies are adequately being corrected. A corrective action status report shall be prepared by the Contractor's shoring engineer. The above outlined procedures shall be repeated until the corrective action status report confirms that all deficiencies have adequately been corrected.
3. Design the excavation support in accordance with the design criteria specified herein and in the Contract Documents. The criteria are intended for guidance and are the minimum acceptable.
4. Where applicable, the design and construction of the support system shall conform to the requirements of the AISC Manual of Steel Construction, unless otherwise stated.
5. Design the excavation support system and components to support lateral earth pressures, unrelieved hydrostatic pressures, utility loads, rail loads, traffic and construction loads, and building and other surcharge loads to allow the safe and expeditious construction of the permanent structures without movement or settlement of the ground, and to prevent damage to or movement of adjacent buildings, structures, utilities, and other improvements. The minimum lateral design earth pressure in all cases shall be determined by the Contractor’s Shoring Engineer. All of the other above loadings shall be

determined by Contractor's shoring engineer and added to the minimum design criteria. The design shall account for staged removal of bracing to suit the sequence of concrete placement for permanent structures and of backfill.

6. Design members to support the maximum loads that can occur during construction. For the purpose of this Section, the design load is the maximum load the support member will have to carry in actual practice, and the proof load is a specified test load greater than the design load.
7. Employ wales, struts, rakers, and tieback anchors for horizontal support for excavation faces retained by soldier piles and lagging, sheet piling, or other methods as may be approved by Engineer. Provide struts with intermediate vertical and horizontal supports if necessary to prevent buckling. Bracing members shall be structural steel. Tiebacks shall be high strength tendons or rods.
8. Take into account stresses due to temperature variations in the design of the struts. Make provisions to protect struts against deformations and stress variations induced by temperature fluctuations.
9. The splicing of an element of the support system will not be permitted.
10. Analyze elements supporting vertical loads and lateral pressures for combined axial load and bending.
11. Lateral loads due to soil and surcharges shall not be transmitted to the permanent structures, or portions thereof, until the concrete has reached sufficient strength to resist said loads, and then, not until the section to be loaded has been checked for strength and deflection and the method of load transmittal accepted by Engineer. The removal of struts shall not increase the design loading on the permanent structures.
12. In a bracing system where wales are not used and a direct strut to soldier pile connection is used, consider an additional provision for bending stress due to the eccentricity of lateral loading of 10% of the depth of the member in each direction in the design of the strut member.
13. Design compression member connections for their compressive loads and for a tensile and shearing load equal to 10% of the design compressive load unless tensile or shearing loads are greater.
14. Driven soldier piles may be assumed as fully braced against buckling in the plane of lagging. In the plane perpendicular to the lagging, the column length shall be taken as the distance between braced points.
15. Backfill soldier piles installed in predrilled holes with lean concrete and allow to set up prior to the start of excavation.
16. Vertical members of flexible wall systems may be designed under the assumption that they are hinged at the bottom of the pile supported excavation and at all bracing levels except the topmost level.
17. In order to satisfy a hinge condition at the bottom of excavation in soil, the vertical wall members shall have at least the minimum penetration necessary to develop the passive resistance of ground material in which piles are embedded, or cantilever action shall be assumed about the lowest installed brace.
18. The calculated deflection of any element of the support system shall not exceed 13 mm (1/2-inch) during excavation or brace removal.
19. Apply active pressure above the pile subgrade elevation to the full panel width between soldier pile centers and to the width of the soldier pile or encasement below pile subgrade. Passive pressure for calculation of embedment required shall be taken as acting on 1.5

times diameter for soldier piles circular in plan and 2.0 times width for soldier piles rectangular in plan.

20. To account for the concentration of soil pressures at struts and tieback locations, the bending moments taken from pressure diagrams (hydrostatic and surcharge pressures excluded) may be reduced by 20 percent when calculating flexure requirements for vertical members and wales of flexible wall systems.
21. Where the loading conditions on opposite sides of an excavation are not equal, analyze the stability of the temporary retaining structure and design structural members so as to take this condition into account.
22. In design of vertical members and wales of flexible wall systems, basic allowable unit stresses may be increased 20%. Design bracing members and connections using basic allowable unit stresses.
23. For calculation of brace loads, vertical wall members may be assumed as several independent simple beams supported at brace levels and their continuity effects ignored. The sum of reactions at each support is used as the design brace load. The full loading on cantilevered portions shall be considered as acting directly upon the supporting brace level. An assumed strut shall be considered to exist at the bottom of the excavation when the minimum pile penetration below subgrade, or deeper, is satisfied. Where wales are a part of the support system, they shall be designed according to the principles of statics.

B. Tieback Analysis and Design:

1. Investigate loading and use the most critical case for design.
2. Make a check of the overall stability (sliding, rotational, etc.) of the zone forming the anchoring mass of earth. The width of resisting surface shall be taken not greater than the distance from the support wall back to the vertical plane passing through the end of the shortest anchor. For a rotational analysis using the slip circle method the design shall yield a factor of safety of at least 1.5, based on loading and the physical properties tabulated.
3. For purposes of determining the effective length of anchors, take the failure plane of the soil mass behind the wall at a minimum angle of 45 degrees measured from the vertical. Anchors shall be considered as receiving resistance from only the soil mass acting beyond the indicated failure plane. Consideration shall be given to increased extent of the failure zone due to high surcharge loads.
4. For loading combinations found, determine the allowable value of adhesion between the soil and the anchor for design of effective embedded length of each individual anchor in various strata. The effective length thus found shall be increased by at least 10% to make allowance for unforeseen field variables.
5. The angle between the direction of the anchor and the horizontal line perpendicular to the support of excavation wall shall be chosen by the Contractor within a range of 0 degrees to 30 degrees. Account shall be taken of the effects of resulting vertical components and associated structural implications arising there from, particularly regarding toe penetration requirements.
6. Install anchors in predrilled holes and pressure grout to ensure firm contact with the surrounding soil.
7. For drilled-in anchors, the total anchor load shall be developed in bond between steel and grout acting within effective length of the anchorage.
8. The final working stress shall not exceed 60% of the ultimate tensile strength of the steel nor 70% of its yield strength loads where high-strength tie rod steel is used.

9. For tieback anchors of high strength steel, a pretest load of at least 140% of working load shall be applied. The load shall then be relaxed to not less than 100% of the working load. Final pretest stress in the steel is not to exceed 80% of the ultimate strength nor the manufacturer's recommendations as shown in his catalog or otherwise stated by him in writing.
10. Spacing of the tiebacks shall ensure no overlap of resisting soil stress bulbs in assuming full value of anchorage for each tieback. In the event of overlap, then a reduction factor shall be used for ties effected. In any one plane the anchors shall have a minimum clear distance between them of 1.5 meters (5 feet). Tiebacks having overlapping soil stress bulbs shall be pretested simultaneously.
11. Use good engineering practice, a knowledge of the local or regional subsurface conditions, available geotechnical or subsurface information, and studies performed by the Contractor to investigate the subsurface conditions at the Site in the analysis and design of tieback systems.
12. The value of overburden pressure, if used for adhesion calculations, shall not include surcharge loads.
13. Tiebacks shall not be placed closer than 3 meters (10 feet) to foundation structures of existing buildings.

C. Monitoring:
   1. Pre-excavation Survey:
      a. Contractor shall document all existing damage to adjacent facilities and submit the information to the Owner prior to performing any excavation. Documentation shall include a written description, diagrams, measurements, and photographs as appropriate.
      b. Establish lines of monitoring points, perpendicular to the excavation face, for at least two sides of each excavation where monitoring is required. Space the lines of monitoring points no more than 6 meters (20 feet) apart, and a minimum of three lines shall be established for each excavation side to be monitored. Each monitoring line shall consist of a minimum of four monitoring points spaced no more than 3 meters (10 feet) apart. Locate the first monitoring point in each line at the top of the braced excavation. The monitoring lines shall extend from the excavation face to a distance equivalent to twice the total excavation depth. The base of each monitoring point monument shall extend to a depth of at least 1.5 meters (5 feet) below the ground surface. Establish surface monitoring points prior to beginning an excavation.
      c. Each survey reading shall consist of measuring the vertical and horizontal location of each monitoring point. Make the initial set of readings prior to the start of the excavation. Make each additional set of readings at each 1.5-meter (5foot) increment of vertical excavation depth, immediately before and immediately after internal bracing or tiebacks are installed. After the excavation has been completed, take readings at 7-day intervals thereafter and until movements have been determined by Contractor's shoring engineer to have ceased. If portions of the bracing system are removed at any time, make readings immediately prior to removal and immediately after removal.
      d. Contractor's shoring engineer shall reduce and review the monitoring data and submit a summary of the data to Engineer on a weekly basis. As a minimum, this summary shall include graphical plots of the monitoring data and Contractor's shoring engineer's interpretation thereof.

D. Work Site Conditions:
   1. Provision for Contingencies:
      a. Monitor the performance of the components of the support system for both vertical and horizontal movement at regular intervals not to exceed three days.
      b. Provide a contingency plan or alternative procedure for implementation if unfavorable performance is evident.
      c. Keep the materials and equipment necessary to implement the contingency plan on hand.
   2. Employ caution in the areas of utility facilities, which shall be exposed by hand or other excavation methods acceptable to Owner.
E. Welding Standards:
   1. Comply with applicable provisions of AWS D1.1.
   2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved, and if pertinent, has undergone recertification.

PART 2 MATERIALS

2.01 STRUCTURAL STEEL: STEEL H-PILES, WF SHAPES, BRACING MEMBERS, FABRICATED CONNECTIONS, AND ALL OTHER ACCESSORIES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36.

2.02 STRUCTURAL STEEL SHEET PILES

A. Steel sheet piling shall conform to the requirements of ASTM A328.

B. Steel sheet piling and interlocks shall not have excessive kinks, camber, or twists that would prevent the pile from free sliding.

2.03 Reinforcing Steel: Shall conform to the requirements of Section 3200.

2.04 Field Welding: Shall be performed by certified welders and be in accordance with AWS D1.1.

2.05 Tiebacks: Shall be high strength steel tendons or rods encased in concrete grout. Use of helical screw anchors is strictly prohibited.

2.06 CONCRETE

A. Lean grout shall be a mixture of Type V cement, sand, and fly ash in the proportions of one bag cement, 5 cubic feet fly ash, and sufficient aggregate and mix water to yield 27 cubic feet and shall be placed in such a manner as to present a firm, stable mass capable of retaining shape and position during excavation operations, yet allow relative ease in chipping out for placement of lagging.

B. All other concrete shall conform to the requirements of Section 03300.

2.07 Timber Lagging: Shall be of a structural grade providing a minimum allowable working stress of 7.6 MPa (1,100 psi) where a system of timber lagging is to be used to support earth excavation.

2.08 Other Materials: Shall be of the size, shape and properties best fitted for their intended use.

2.09 Materials: Whether new or used, shall be sound and free of defects that might impair strength or function.

PART 3 EXECUTION

3.01 SOLDIER PILES INSTALLATION

A. In the initial positioning of soldier piles at the ground surface, make allowances for installation deviations, and the probable inward movements of the support wall during excavation. Intrusion of wall members into the neat lines of the structures will not be permitted. Where sheeting systems are located contiguous to the neat lines of the structure, provide a reasonable percentage of the depth of excavation to subgrade for initial installation offset.

B. Install soldier piles by preboring or other preexcavating methods to tip elevation shown on the approved working drawings.

C. Case or fill the prebored holes with drill mud, as required, to prevent caving of the sides of the hole prior to placement of the soldier pile and encasement.

D. Pile Embedment:

1. Carry the bottom of the support system to a depth below the main excavation to provide sufficient lateral support to limit the maximum pile deflection to 13 mm (0.5-inch).

E. After seating the soldier piles, encase the piles with lean grout, completely encasing the pile.

F. Design of soldier piles shall conform to the criteria specified in PART 1 - QUALITY ASSURANCE, this Section.

G. Vertical Support System with Tiebacks:

1. Install piles or other vertical support system members incorporated in a system using tieback anchors so that vertical support members are capable of resisting vertical components of tieback loads without significant settlement during excavation and construction.
2. Install the vertical support members so that settlements will not be caused by construction. In general, install the members to be end bearing in a stratum below the maximum depth of excavation and capable of carrying the total vertical loads without assistance of skin friction in the depth of the excavation.

3.02 LAGGING AND SHEETING INSTALLATION:

A. Use timber lagging or contact sheeting, steel sheeting, or precast reinforced concrete members secured in place for sheeting of excavations.

B. Install sheeting and lagging with no gap between the boards. Carefully perform excavation for the installation of sheeting and lagging to minimize or eliminate the formation of voids behind the lagging. As installation progresses, backfill voids between the excavation face and the lagging or sheeting with sand or soil compacted in place. Pack gaps in lagging with materials such as hay or burlap to allow drainage of groundwater without substantial loss of soil.

C. If unstable material is encountered, take measures to retain the material in place or to otherwise prevent soil displacement.

D. Sheeting and lagging placement shall follow the excavation. The maximum height of the unsheeted or unlagged face of excavation shall be determined by the job conditions, but in no case shall it exceed at anytime 1.2 meters (4 feet) in predominately clayey soils or 1 meter (3 feet) in sandy soils. If water flows from the face of the excavation, or soil in the face moves toward the excavated area, the maximum height of the unlagged face shall not exceed 375 mm (15 inches), or as directed by Resident Project Representative.

E. Sheet piling not cut to length shall be cut off after driving at elevations as indicated, if applicable.

F. Drive sheet piling by recognized methods of good practice in soil conditions present using a hammer with sufficient energy to penetrate overburden material without damaging the sheet piling or adjacent existing facilities. Avoid splicing of sheet piling when possible. Z-pile sections shall be driven with ball edge "ahead."

G. Provide protection to sheet pile ends, as required, to ease driving, assure penetration and prevent tearing or splitting in hard driving conditions.

H. In running sand or silt, provide a positive means of securing the lagging to the soldier piles to avoid shifting or falling off of the lagging. Also provide a positive means of securing the material behind the lagging or sheeting.

I. A sufficient quantity of material shall be on hand at all times (for sheeting, shoring, bracing and other purposes) for the safe execution of the work and for use in case of accident or other emergency.

J. Place wales, when used, on the inside face of the support wall. Make provisions to wedge, pack, shim, or otherwise assure tight bearing between wales and soldier piles, with ample bearing area to assure transfer of the load.

K. Remove lean grout only to the extent that is required for installation of the lagging.

3.03 INTERNAL BRACING SUPPORT SYSTEMS INSTALLATION

A. The internal bracing support system includes lagging and sheeting, soldier piles, wales, struts, and shores.

B. Brace as soon as possible after reaching prescribed excavation levels.

C. Provide struts with intermediate bracing if necessary, to enable them to carry the maximum design load without distortion or buckling.

D. Provide diagonal bracing where needed to maintain the stability of the system.

E. Include web stiffeners, plates, or angles to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities due to field fabrication and assembly.

F. Install bracing support members and maintain in tight contact with each other and with the surface being supported. Install support system instrumentation if directed by Owner or Engineer.

G. Coordinate excavation work with installation of bracing and preloading.

H. Design primary support members to support the maximum loads occurring during the excavation or removal stages, and as required by design criteria specified under PART 1 - QUALITY ASSURANCE, this Section, and on the Contract Drawings.

I. Preloading:

1. Primary bracing members including struts, shores, and similar members shall be preloaded at installation. The amount of the preload shall be determined by Contractor's shoring engineer. Tiebacks shall be preloaded as specified for those installations.
2. Use procedures that produce uniform loading of the bracing member without appreciable eccentricities, or overstressing and distortion of the members of the wall system.
3. Make provisions for permanently fixing the required load in the member using steel shims or wedges welded into place.
4. Wooden wedges shall not be used to preload a bracing member.
5. The preloading system shall include a means to determine within 5% the amount of preload induced into the bracing members.

J. Excavation shall not go deeper than 1 meter (3 feet) below the point of support about to be placed. Install the support and preload immediately after installation of bracing and prior to continuing excavation.

3.04 TIEBACK SUPPORT SYSTEMS INSTALLATION

A. If Contractor elects to use a support system which includes tieback anchors, he shall submit full details of his proposed system to the Engineer for review prior to commencement of the work. The submittal shall be in accordance with instructions specified under PART 1 - SUBMITTALS, this Section. Design shall be in accordance with tieback criteria specified under PART 1 -QUALITY ASSURANCE, this Section.

B. Install tieback systems in accordance with the working drawings. Install the anchorage in soil no closer than a plane extending upward at an angle of 45 degrees to the horizontal from the limit of the lowest depth of excavation.

C. Stress all the tiebacks to proof loads equal to 120% of the maximum design load. Maintain the proof load for 30 minutes prior to reducing it to the design load. Anchors which lose more than 5% of the proof load during the 30-minute period will not be acceptable.

D. During proof testing, load in increments of 4.5 metric tons (5 tons) at one-minute intervals providing means to measure the load application within an accuracy of plus or minus 5%. Record axial movement corresponding to incremental applications of load to an accuracy of 0.25 mm (0.01-inch).

E. After reducing the tieback load to the design load, encase tiebacks in grout. Maintain the design load until the tiebacks are fixed in place.

F. Use a method of fixation which will limit the load loss to no more than 5% of the design load in the transfer of the loads from the jacks to the support system.

G. Provide and maintain convenient access and appropriate means so that these observations may be made.

H. Grease and wrap drilled-in anchors or otherwise treat to ensure the absence of bond on the portion of the tieback between the face of wall and the anchorage.

I. Performance Tests on Tiebacks:

1. Conduct performance tests on at least three selected tiebacks prior to installing any of the remaining tiebacks, which will all be proof loaded. Test tiebacks at each level of support in the excavation. A minimum of 10% of the tiebacks installed shall be performance tested. All performance tests shall be measured with a load cell accurate to within 1% of the design load.

2. Performance tests for tiebacks in cohesionless soils shall consist of the following cyclic loadings: 0 tons to 0.25 DL (Design Load); 0.25 DL to 2 tons; 2 tons to 0.50 DL; 0.50 DL to 2 tons; 2 tons to 0.75 DL; 0.75 DL to 2 tons; 2 tons to 1.0 DL; 1.0 DL to 2 tons; 2 tons to 1.2 DL; 1.2 DL to 2 tons; 2 tons to 1.33 DL. The load shall then be reduced to 100% of the design load and locked off. Record axial movement corresponding to incremental applications of 25% of the design load for each individual cycle of loading to an accuracy of 0.025 mm (0.001-inch).

3. Performance tests for tiebacks in cohesive soils shall consist of the following cyclic loadings: 0 tons to 0.25 DL (Design Load); 0.25 DL to 1.8 m tons (2 tons); 1.8 m tons (2 tons) to 0.50 DL; 0.50 DL to 1.8 m tons (2 tons); 1.8 m tons (2 tons) to 0.75 DL; 0.75 DL to 1.8 m tons (2 tons); 1.8 m tons (2 tons) to 1.0 DL; 1.0 DL to 1.8 m tons (2 tons); 1.8 m tons (2 tons) to 1.2 DL; 1.2 DL to 1.8 m tons (2 tons); 1.8 m tons (2 tons) to 1.33 DL. The load shall then be reduced to 100% of the design load and maintained continuously for a minimum of 10 hours. Measure axial movements to an accuracy of 0.025 mm (0.001 inch) and record on 5-minute intervals for the first 100 minutes and 10-minute intervals thereafter.

4. The data from all performance tests shall be interpreted by Contractor's shoring engineer. This interpretation will constitute an evaluation of anchor allowable load-carrying capacities and shall be used by Contractor's shoring engineer to set a criteria for allowable movement of the proof tests.

3.05 TRENCH EXCAVATION

A. Perform sheeting, shoring, and bracing for trench excavation for utility facilities and other purposes in accordance with the safety requirements of the General Conditions.

B. Provide sheeting, shoring, and bracing for trench excavation in the subgrade of the excavation to prevent movement of the main excavation support system.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. No measurement will be made for this item.

4.02 PAYMENT

A. Sheeting and Shored Excavations

1. Payment for Sheeting and Shored Excavations is included in the lump sum price for the appropriate precast concrete structure(s) included in this project.

END OF SECTION

SECTION 32 1200

FLEXIBLE PAVEMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Prepare subgrade to receive base course.

B. Provide compacted base course.

C. Prime base course and place asphaltic concrete hot mix (ACHM) binder course.

D. Tack base course and place ACHM surface course.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 1613 – Concrete Curb and Gutter

C. Section 33 4000 – Storm Drainage Utilities

1.03 SUBMITTALS

A. See Related Work

1.04 REFERENCES

A. Arkansas Department of Transportation (ARDOT).

1. Standard Specifications for Highway Construction, Edition of 2014, hereafter referred to as “ARDOT Standard Specifications”.

PART 2 PRODUCTS

2.01 BASE COURSE MATERIALS

A. Crushed Stone: Class 7, meeting the requirements of Section 303 of the ARDOT Standard Specifications, or approved equal.

B. Prime Coat: Medium curing liquid asphalt, MC-30, or approved equal, meeting the requirements of Section 401 of the ARDOT Standard Specifications.

C. Tack Coat: Shall be applied as specified and meeting the requirements of Section 401 of the ARDOT Standard Specifications.

2.02 ASPHALT PAVEMENT MATERIALS

A. ACHM Surface Course:

1. PG 64-22 mix as described in Sections 407 and 409 of the ARDOT Standard Specifications.

2. The surface course shall be composed of a mixture of mineral aggregate and asphalt cement in the proportions by weight for the type mixture designated.

B. ACHM Binder Course:

1. PG 64-22 mix as described in Section 407 and 409 of the ARDOT Standard Specifications.

2. The binder course shall be composed of mixture of mineral aggregate and asphalt cement in the proportions by weight for the type mixture designated.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Ensure grading of the subgrade to the required elevation.

B. Scarify to a depth of six inches the subgrade where the base course is to be placed.

C. Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess of moisture exists, rework and aerate subgrade until optimum moisture content is obtained.

D. Re-compact the subgrade to a minimum of 95% of the maximum dry density at or near the option moisture content as determined by ASTM D1557.

E. Before final rolling, shape the entire area to the required cross section, adding additional subsoil as required and compact the subgrade surface to the required density.

3.02 PLACEMENT OF BASE COURSE

A. Place the crushed stone base material over the prepared subgrade in accordance with the construction methods described in Section 303 of the ARDOT Standard Specifications.

B. Add water during compaction to bring the base course materials to optimum moisture content. When excess moisture exists, rework the base course materials until optimum moisture content is obtained.

C. Compact the base course to 100% of the maximum dry density as determined by ASTM D 1557.

3.03 PLACE PRIME AND TACK COAT

A. Apply the bituminous prime coat to the compacted base at the rate of 0.3 to 0.4 gallons per square yard. Apply the bituminous tack cost to the prepared base at the rate of 0.03 gallon to 0.10 gallon per square yard as designated by the Engineer.

B. Clean the base course surface and place the prime and tack coats in accordance with the requirements of Section 401 of the ARDOT Standard Specifications.

3.04 PLACING ACHM SURFACE COURSE

A. Construction Methods: Section 410, ARDOT Standard Specifications.

B. Temperature range mix.

1. When discharged from mixer: 285 degrees F to 325 degrees F.
2. When placed on base course: 275 degrees F. to 325 degrees F.

C. Temperature of air: Do not place ACHM when air temperature in the shade is below 40 degrees F.

D. Place asphalt pavement to compacted depth shown on Drawing.

E. Compact to required density, with approved rolling equipment. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

F. Required density: 92% - 96% of maximum theoretical density.

G. Carry out compaction in three operations in pass sequence. Ensure each pass of roller overlaps previous passes to ensure smooth surface free of roller marks. Keep roller wheels sufficiently moist so as not to pick up material.

H. Perform hand tamping in areas not accessible to rolling equipment.

I. Ensure joints made during paving operations and at connection to existing pavement are straight, clean, vertical and free of broken or loose material. Construct joints to ensure a continuous bond between the courses and to obtain the required density. Provide all joints with the same texture as other sections of the course and meet the requirements for smoothness and grade.

J. Ensure surface of completed asphalt pavement is true to lines, profiles and elevations indicated, and is free from depressions exceeding ¼ inch when measured with a 10 foot straightedge.

K. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature.

3.05 FIELD QUALITY CONTROL

A. Testing laboratory will make in-place tests of density and moisture content of the subgrade and the base course in accordance with ASTM D 6938.

B. Testing laboratory will make density tests of compacted asphalt paving in accordance with ASTM D 2950.

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Prepare subgrade to receive base course materials for traffic bearing drive.

B. Place and compact base course materials for drive.

C. Concrete drive complete with reinforcement.

1.02 RELATED WORK

A. Section 32 1373 – Concrete Paving Joint Sealants

B. Section 31 2000 - Earth Moving

C. Section 32 1376 - Sidewalks

D. Section 32 1613 - Concrete Curb & Gutters

1.03 SUBMITTAL

A. See Related Work

1.04 REFERENCES

A. ASTM C150- Portland Cement.

B. ASTM C94 – Ready Mixed Concrete.

C. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 – Deformed and Plain Billet – Steel Bar for Concrete Reinforcement.

E. ASTM D1751 – Preformed Expansion Joint Filler for concrete Paving and Structural construction.

1.05 INSPECTION AND TESTING

A. Inspection and testing of concrete will be performed by a firm approved by the owner and paid for by the Contractor, in accordance with Section 01 4529.

B. Three (3) concrete test cylinders will be taken during cold weather concreting, and be cured on job site under same conditions as concrete it represents.

C. One (1) slump test will be taken for each set of test cylinders taken.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Gravel Base: Angular crushed natural stone: free shale, clay and friable materials and debris.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C150; Normal –Type I. Materials for concrete paving shall conform to the requirements for Sections 32 0523–Concrete Work.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

2.03 REINFORCEMENT

A. Reinforcing Steel: (60) yield strength; plain and deformed billet steel bars: ASTM A615; plain finish.

B. Welded Steel Wire Fabric: Plain type, ASTM, 6” x 6: W2.9x W2.9 size.

C. Tie Wire: Minimum 16 gage annealed type, or patented system acceptable to Architect/Engineer.

2.04 FORMWORK AND ACCESSORIES

A. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete.

B. Joint Filler: Minimum ½-inch thick asphaltic impregnated fiberboard ASTM D1751.

C. Concrete Curing Compound: Chlorinated rubber type: clear color; ASTM C309.

2.05 CONCRETE MIX

A. Mix and proportion to produce minimum 3500 psi concrete at 28 days with maximum slump of 3 inches and 4 to 6 percent air entrainment.

B. Use accelerating admixtures in cold weather only when acceptable to Architect/Engineer. Use of admixtures shall not relax cold weather placement requirements. Do not use calcium chloride.

C. Use set-retarding admixtures during hot weather only when acceptable to Architect/Engineer.

PART 3 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations.

B. Fill soft spots and hollows with additional fill.

3.02 PLACEMENT OF GRAVEL FILL AND SAND CUSHION

A. Place and level gravel fill over prepared subgrade to a compacted depth indicated on drawings true to lines and levels.

B. During concrete placement, keep base sufficiently moist to prevent excessive absorption of water from freshly placed concrete.

3.03 FORMING

A. Form vertical surfaces to full depth and securely position to required lines and levels. Ensure form ties are not placed so as to pass through concrete.

B. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

3.04 PLACING REINFORCEMENT

A. Reinforce concrete drives: Allow for minimum 1 -1/2 inch concrete cover.

B. Do not extend wire mesh reinforcing through expansion and contraction joints. Provide dowelled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.05 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:

1. Ensure that excavation and formwork are completed and within the allowed tolerances.
2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
3. Check that reinforcement is secured in place.
4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.06 FORMING EXPANSION AND CONTRACTION JOINTS

A. Install control expansion joints in accordance with ACI 301-99 Section 5

B. Place expansion and contraction joints shown on plans. Where joints are not illustrated, provide control joints for every 100 SF of surface area and expansion joints for every 400 SF of surface area. Where possible, make joints coincide with joints in adjacent concrete.

C. Fit joints with filler of required profiles, set drives perpendicular to longitudinal axis of drives. Recess ¼ inch below finished concrete surface.

3.07 PLACING CONCRETE

A. Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate.

B. Avoid working mortar to surface.

C. Make ¼-inch wide dummy joints as indicated on Drawings.

D. Round all edges, including edges of dummy and expansion and contraction joints, with ¼-inch radius edging tool.

E. Where paved surfaces are adjacent to walks, make concrete curbs and gutters integral with walks. Make expansion and contraction joints of curbs coincide with walk joints. Provide dummy joint at line between walks and curbs.

F. All drives, sidewalks, ramps, and stairs are to have a broom finish applied to the surfaces, unless otherwise noted.

G. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet when measured with straightedge.

H. Apply curing compound on finished surfaces immediately after placement. Apply in accordance with manufacturer's recommendations.

I. All expansion joints must be sealed with an approved joint sealant.

END OF SECTION

SECTION 32 1376
SIDEWALKS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing concrete sidewalk where shown on Drawings.

B. Providing concrete handicap ramps where shown on Drawings.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 0523 – Cement and Concrete for Exterior Improvements.

C. Section 32 1373 – Concrete Paving Joint Sealants.

1.03 SUBMITTALS

A. See Related Work

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM D 1751, Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

PART 2 PRODUCTS

2.01 CONCRETE

A. General: Materials for use in sidewalk construction shall conform to the requirements for Section 32 0523, and shall be 3500 psi concrete.

2.02 WORK INCLUDED

A. The joint filler for all expansion joints shall be manufactured according to ASTM D 1751 and shall be elastic waterproof pre-molded compound that will not become soft and push out in hot weather, nor hard and brittle and chip out in cold weather. The strips shall be ½" in thickness except where shown otherwise on the Drawings; their width shall at least equal the full thickness of the slab; and their length shall at least equal the width of the slab at the joint.

2.03 FORMS

A. Forms shall be steel or 2" nominal thickness lumber true to proper dimensions, smooth, sufficiently braced to resist springing out of shape, and accurately set to proper lines and grades. Used forms shall be free of dirt and mortar. Cross forms shall be ¼" steel of the full width and depth of the concrete work and left in place until the wearing surface has been floated and has obtained its initial set.

2.04 CURING COMPOUND

A. Liquid membrane forming curing compound conforming to AASHTO M 148, Type 2, white pigmented (all-resin base).

2.05 SURFACE TREATMENT

A. Scofield Repello FPS surface treatment for water and stain repellency to concrete surfaces.

PART 3 EXECUTION

3.01 GRADING AND SUBGRADING

A. Prepare subgrade for walks by excavating or filling to a depth below the top of an intended pavement equal to the thickness of the finished walk and in exact conformity to the grade approved by the Engineer. Remove vegetative matter or material that will not compact properly and replace with suitable material. Place all fill required to bring the subgrade to the proper level in thin layers not exceeding 4 inches deep, and thoroughly ram, tamp or roll until it has been made compact and solid. Bring subgrade to true grade in a uniformly firm condition before

placing the concrete. Do not place concrete on the subgrade until the Engineer has inspected and approved both grade and condition of subgrade.

3.02 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:

1. Ensure that excavation and formwork are completed and within the allowed tolerances.
2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
3. Check that reinforcement is secured in place.
4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-99 except as amended by this section.

3.03 **SETTING FORMS**

A. Stake forms and hold to the established lines and grades. Provide minimum 1/8" per foot fall away from structures or as shown on the drawings.

3.04 TREATMENT

A. Wet wood and coat metal forms with oil, soft soap, or whitewash before depositing any material against them. Remove all mortar and dirt from forms that have been previously used.

3.05 MARKINGS

A. Cut surface of concrete walks into flags by marking with an edging tool having a radius of ¼". Make flags not longer than 6 feet on any side nor longer than the width of the sidewalk. Round the slabs on all surface edges, including the cross markings between flags, to a radius of ¼".

3.06 JOINTS

A. Provide an expansion joint ½" in thickness, extending full depth of the concrete and with filler as herein specified, at intervals of not more than 15 feet, or as shown on plans. Provide a similar joint ½" in thickness in each walkway at intersection of walkways. Also provide an expansion joint ½" in thickness at each intersection of sidewalk and street curb and at such other points as may be designated by the Engineer. Separate sidewalk from abutting structures by ½" expansion joints. Place expansion joints ½" in thickness extending full depth of the concrete in a square outline around each object in sidewalks, such as fire hydrants, utility poles light standards, etc.

B. All expansion joints must be sealed with an approved joint sealant.

3.07 PLACING CONCRETE

A. Place concrete only on a moist subgrade and not adjacent to or around utility structures until such structures have been set to the proper grade.

B. Transport from the mixer and place by such a means as will not cause segregation of materials or loss of ingredients. Deposit successive batches in one layer by a continuous operation, completing individual sections to the required depth and width. Do not use concrete that has taken its initial set. Fill forms and bring the concrete to the established grade by means of a strike board or straight edge. Thoroughly tamp concrete until mortar is flushed to the surface sufficiently to finish and mark the surface.

C. Spade and/or vibrate the concrete so that it will flow together and completely fill all void spaces especially along forms (including cross forms of joints) to prevent honeycombing and shall be struck off and tamped in an approved manner, until dense surface is obtained, free from porous or rough spots and at the required sections and grade.

D. Use method of placing the various sections so as to produce a straight clean-out joint between them, in order to make each section and independent unit. Do not use any concrete in excess of that needed to complete a section at the stopping of work.

E. Do not pour concrete when temperature is below 35 degrees Fahrenheit, and do not place concrete on frozen subgrade. Take all necessary precautions to prevent damage to concrete in excess of that needed to complete a section at the stopping of work.

F. At all times during construction period, maintain proper drainage, by natural flow or pumping as required, so that water will drain away from excavated areas. Do not allow water to stand in any excavations, or elsewhere, to be covered by concrete. Provide and maintain in proper working order all necessary pumping and other equipment required to maintain drainage.

3.08 FINISH

A. After the concrete has been brought to the established grade by means of a strike board and tamped to bring the mortar to surface, float to a true even surface and finish with steel trowel. After the trowel finish has taken its initial set, brush surface lightly at right angles to center line of sidewalk with a soft bristle brush.

B. Do not apply heat to the concrete surface to hasten its hardening.

3.09 CURING AND PROTECTION:

A. As soon as the concrete has hardened sufficiently to prevent damage, apply specified liquid membrane-forming curing compound in accordance with manufacturer's written instructions.

B. Protect the freshly finished concrete from hot sun and drying winds until the curing compound is applied. Do not allow the concrete surface to be damaged or pitted by raindrops. Provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the proceeding twelve hours. Erect and maintain suitable barriers to protect the concrete. Repair any section damaged from traffic or other causes occurring prior to its official acceptance. Before the sidewalk is opened to traffic, remove and dispose of the covering.

C. Apply surface treatment to all concrete surfaces per manufacturer's requirements.

3.10 FREEZING TEMPERATURE

A. If at any time during the progress of the work, the temperature is predicted to drop below 35 degrees Fahrenheit within 24 hours after placement, heat the water and aggregates and take precautions to protect the work from freezing for at least five days.

END OF SECTION

SECTION 32 1613
CONCRETE CURB AND GUTTER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Construct cast-in-place combination curb and gutter.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving.

B. Section 32 1376 – Sidewalks.

C. Section 32 0523 – Cement & Concrete for exterior improvements.

D. Section 32 1373- Concrete Paving Joint Sealants.

1.03 SUBMITTALS

A. See Related Work

1.04 QUALITY ASSURANCE

A. Perform cast-in-place concrete in accordance with ACI 301 and Section 32 0523.

1. Standard Specifications for Highway construction, Edition of 2014, hereafter referred to as “AHTD Standard Specifications”.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ready Mixed concrete: ASTM C94 and Articles 2.01 through 2.06 of Section 32 0523.

B. Curing Compound: ASTM C309.

C. Pre-formed expansion joint fillers: ASTM D1751-18.

1. Thickness: ½ inch.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Grade subgrade and compact in same manner and to same density as specified in Section 31 2000 controlled fill.

3.02 GENERAL

A. Notify Architect/Engineer for inspection at least 24 hours before the planned time to pour concrete.

B. Inspection:

1. Ensure that excavation and formwork are completed and within the allowed tolerances.
2. Ensure that ice and excess water are removed, no frost is present, and that ground is not frozen.
3. Check that reinforcement is secured in place.
4. Verify that insulation, anchors, and other embedded items are secured in position.

C. Install concrete work in accordance with ACI 301-20 except as amended by this section.

3.03 INSTALLATION

A. Cast-in-place Concrete: Refer to Section 32 0523

1. See standard Detail Drawings for Curb and Gutter, and for Handicap Ramp.
2. Prepare subgrade in accordance with Section 31 2000.
3. Set forms to line and grade.
4. Install forms over full length of curb.

5. Form contraction joints at maximum 10 feet spacing using steel templates, division plates or sawcuts.
6. Remove templates or plates as soon as concrete has hardened sufficiently to retain its shape.
7. Install preformed expansion joint fillers at maximum 40 feet spacing, at curb returns, and behind curb at abutment to sidewalks and other structures.
8. Place top of expansion joint material ¼ inch below curb surface.
9. Place concrete in position without separation of concrete materials.
10. Consolidate concrete with mechanical vibrators.
11. Round face of curbs at top with finishing tool of correct radius.
12. Finish exposed surfaces with wood float followed by light brushing with broom.
13. Apply curing material and cure for seven days.

B. Repair of surface defects: Comply with requirements of Section 32 0523.

C. Field Quality Control: Comply with requirements of Section 32 0523.

D. Protection of Completed Work: Comply with requirements of Section 32 0523.

END OF SECTION

SECTION 32 1700

PAVEMENT MARKING AND CONTROL DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Section 01 3300 Submittals.

B. Section 32 1313 Concrete Paving.

1.02 SUMMARY

A. This Section includes the following:

1. Pavement marking paint.
2. Wheel stop bumpers.

1.03 SUBMITTAL

A. Product Data: Submit manufacturer's printed product sheets for each product indicated.

B. Provide manufacturer's standard color selection chart for each color as shown on the drawings.

C. Submit written conformation from the paint manufacturer that the selected paint products are compatible with the approved asphalt mix design.

1.04 REFERENCES

A. Installer Qualifications: An experienced installer who has specialized in installing stripping material layouts to the extent of those indicted for this Project and whose work has resulted in stripping installations with a record of successful in service performance.

B. Source Limitations: Obtain each type of paint through on source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to paint manufacturer, a copy of the approved asphalt overlay mix design for verification that the selected paints will adhere to the substrate without excessive bleed through, cracking, fading.

D. Apply marking paint in dry weather when pavement and atmospheric temperature fifty (50) degrees F. or above and are anticipated to remain above fifty (50) degrees F. for four (4) hours after completing application.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, curing time, and ,mixing instructions for multi-component materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes. represents.

PART 2 PRODUCTS

2.01 STRIPING AND TRAFFIC CONTROL MARKING PAINTS

A. Parking Lots: Provide contractor grade acrylic, striping paint for new asphalt overlay and seal coat substrates in colors as shown on the drawings.

B. Approved Manufacturers:

1. Sherwin-Williams
2. Engineer Approved

2.02 WHEEL STOP BUMPERS

A. Wheel stop bumpers shall be of type and size as shown on the drawings.

B. Provide manufacturer's recommended galvanized steel mounting spikes. Spikes shall be a minimum of 18" in length and 0.75" diameter.

C. Approved Manufacturers

1. Engineer Approved

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect existing pavement surfaces for conditions and defects that will adversely affect the quality of work, and which cannot be put into an acceptable condition through normal preparatory work as specified.

B. Do not install marking over unsound pavements. If these conditions exist, notify Engineer.

C. Verify that the new asphalt paving is complete and acceptable and the minimum approved cure time has elapsed prior to applying paint.

3.02 PREPARATION

A. Provide qualified technician to supervise equipment and application of markings.

B. Thoroughly clean surfaces free of dirt, sand, gravel, oil and other foreign matter.

C. Layout markings using guidelines, templates and forms. Stencils and templates shall be professional made to industry standards. Use of "free-hand" painting of arrows, symbols or wording shall not be allowed.

D. Layout spacing of parking stalls shall be approved by the Engineer prior to applying paint.

E. Protect adjacent curbs, walks, fences and other items from receiving paint overspray.

3.03 APPLICATION

A. Use commercial air spray striping machine or a commercial airless machine capable of applying an even coating at the manufacturer's recommended thickness in an even width across the strip. Ensure equipment nozzles are clean and properly aligned to produce a uniform line with a sharp edge.

B. Apply marking paint at a rate of one (1) gallon per three to four hundred (300-400) lineal feet of four (4) inch wide strip and a minimum of 15-mils thick or as recommended by the paint manufacturer.

C. Apply stripes straight, even and parallel in accordance with the drawings and approved layout.

D. Apply stripes and other markings in widths and colors as shown on the drawings.

3.04 PROTECTION

A. Barricade marked areas during installation and until the marking paint has dried and is ready for traffic.

3.05 WHEEL STOPS

A. Install wheel stops where shown on the drawings.

B. Install stops as shown in the plan details.

C. Wheel stops shall be installed perpendicular to the length of the parking stall.

END OF SECTION

SECTION 32 1723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Providing pavement markings as shown on Drawings.

1.02 REFERENCE STANDARDS

A. Federal Specifications (FS):
   1. TT-P-115E Paint, Traffic, Highway, White and Yellow.
   2. TT-P-1952B Paint, Traffic, and Airfield Marking, Water Emulsion Base.

B. Federal Standard (Fed. Std.)
   1. No 141B Paint, Varnish, Lacquer, and related materials.

C. Arkansas Department of Transportation (ArDOT)
   1. Standard Specifications for Highway Construction, 2014 Edition

1.03 SUBMITTALS

A. Submit a test report showing either that the proposed batch meets all specified requirements or that a previous batch manufactured using the same formulation as that used in manufacturing the proposed batch for the following properties required in the material specification: weight per gallon, viscosity, fineness of grind, drying time, and gradation. Testing procedures and reports shall be as specified in paragraph 5 of Method 1031.2 of Fed. Std.141.

1.04 DELIVERY, HANDLING AND STORAGE

A. Deliver material in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly labeled at time of use.

B. Furnish paint in containers not larger than five gallons.

C. Store paint on project site. Store emulsion paints to prevent freezing.

1.05 SITE CONDITIONS

A. Unless other wise recommended by the paint manufacturer apply pavement markings material only when the ambient temperature is between 40 and 95 degrees F.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking:
   1. Manufactured according to FS TT-P-115E, FS TT-P-1952B or ArDOT Standards Specification Section 718,719, or 720.
   2. Symbol Color: White.
   3. Handicapped Access Aisles on Asphalt Paving: Color, White
   4. Handicapped Access Aisles on Concrete Paving: Color, ADA Blue
   5. Paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.
   6. Note: Verify colors with owner prior to painting.

B. Roadway:
   1. Manufactured according to ArDOT Standard Specifications Section 719 or 720.
   2. Color:

a. Separating traffic traveling in opposite directions: Yellow
b. Left edge of roadways: Yellow
c. Separating two-way left turn lanes and reversible lanes from other lanes: Yellow
d. All other applications: White
e. Pre-molded striping and symbols as shown and called for on plans.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 30 days before application of markings materials.

B. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required.

C. Completely remove rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed.

D. Where oil or grease are present on old pavements to be marked, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

3.02 EQUIPMENT

A. General: Use only approved machines, tools, and equipment. Maintain equipment in satisfactory operating condition. Han-operated push type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small street and parking areas. Use applicator machine equipped with the necessary paint tanks and spraying nozzles. Equipment shall be capable of applying paint uniformly at coverage specified. Provide sandblasting equipment as required for cleaning surfaces to be painted. Use hand-operated spray guns for use in areas where push-type machines cannot be used.

B. Sandblasting Equipment: Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 c.f.m of air at a pressure of not less than 90 psi at the nozzle for each nozzle used.

C. During concrete placement, keep base sufficiently moist to prevent excessive absorption of water from freshly placed concrete.

3.03 APPLICATION

A. Rate of Application: Apply two (2) coats of paint at manufacturer’s recommended rate with total maximum of 320 lineal feet per gallon per coat with 4” wide stripe. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs, use a straightedge to ensure a uniform, clean, and straight stripe.

B. Paint: Apply paint in stripes of specified width to clean, dry surfaces, unless otherwise approved, only when air and pavement temperature is above 40 F and less than 95 F. Maintain paint temperature within these limits. Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guide lines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Sharply outline all edges of markings. Maintain the maximum drying time requirements of the paint specifications to prevent undue softening of bitument, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, discontinue painting operations until cause of the slow drying is determined and corrected.

3.04 PROTECTION

A. Prevent damage to newly painted surfaces by either placing small markers along newly painted lines or controlling traffic to keep vehicles away from area of newly painted lines.

END OF SECTION

SECTION 32 8411

LANDSCAPE IRRIGATION SYSTEM PERFORMANCE SPECIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings, valves, outlets, backflow preventer, and accessories.

B. Connection to utilities and meter installation.

C. Automatic control system.

1.02 RELATED WORK

A. Section 31 2216 Fine Grading.

B. Section 32 9223 - Sodding.

C. Section 32 9300 - Plants.

1.03 REFERENCES

A. ASTM D 1785 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR).

B. ANSI/ASTM D 2564 - Solvent Cement for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.

C. All applicable plumbing codes, standards, or specifications by building code or governing utility authority for the project location.

D. Rain Bird Irrigation Installation Details and Specifications.

E. Hunter Industries Installation Details and Specifications.

F. NDS Installation Details and Specifications.

1.04 GENERAL DESIGN AND SYSTEM REQUIREMENTS

A. Contractor's design for automatic, electric valve, irrigation system with 100 percent coverage and minimal over spray onto buildings and paved surfaces to meet the following design standards:

1. Compliance with all applicable plumbing codes for the project location.
2. *Irrigation water meter and tap to be provided as part of the irrigation system / by General Contractor as part of the utility installation work.* Meter size and location to be *determined by contractor's system design and coordination with owner and general contractor / as shown in the Utility Coordination Plan.*
3. *General Contractor to provide irrigation system sleeving under pavement crossings at the locations and sizes shown in the Utility Coordination Plan / irrigation shop drawings.* Coordinate with General Contractor to provide any additional sleeves that may be necessary.
4. Provide backflow preventer assembly with *heated and insulated housing and hardwired connections to power source.*
5. Provide automatic controller, control wiring, and hardwired connections to power source. Coordinate controller location with owner, general contractor and electrical contractor.
6. Provide wireless rain and heat sensor device to shut off, delay, and adjust watering cycle times.
7. Pipe sizing must provide for a maximum velocity of 5 feet per second and must provide adequate pressure delivery at all heads for proper performance.
8. Provide separate valve zones for turf and planted bed areas.
9. Provide pop-up spray and/or rotor type outlets for turf areas.

10. Space spray and/or rotor type outlets to provide near 100% overlapped coverage between each outlet.
11. Provide drip irrigation for planted bed areas.
12. Provide additional drip emitters for trees in drip zone areas.
13. Coordinate the locations of controller and backflow preventers to minimize visibility and screen with landscape materials where possible.
14. Piping to be located along back of curbs, pavement edges, and bed edges.
15. Spray from perimeter of areas where feasible.
16. Provide 100% coverage of all newly planted landscape areas on site and in adjacent street rights-of-way and/or other areas as indicated in the Landscape Plan.
17. Provide manual drain valves and sumps, or piped connections to drainage system in sufficient locations to drain the entire system for winterizing.
18. Provide valve boxes and covers at all locations described.
19. Minimize the number of outlets, trenching, and pipe installation where possible.

1.05 SUBMITTALS

A. Irrigation Shop Drawing: Proposed to meet design standards as outlined in 1.4, A, “Design and System Description.” Illustrate system over base of site information including site structures, plant and landscaping features (screened print or AutoCAD drawing provided on request). Provide the following information in the shop drawing/s by labeling, listing, schedule of symbols, etc:

1. Complete schedule of equipment, outlets, valves, etc. to be used.
2. Details for installation of all system components.
3. Locations and sizes of all sleeves and piping.
4. Locations, sizes, estimated GPM flow, and station number of each valve zone.
5. Locations of drain valves and sumps.
6. Locations, size, and type of all spray and/or rotor outlets and nozzles to be used.
7. Locations and types of drip system components
8. Locations of grounding devices.
9. Special programming for any multiple zone operations.

B. Product Information: Provide product specification sheets that clearly identify each system component proposed for use. Indicate specific components when more than one item is covered on spec sheets.

C. Acquire and submit certificate of approval for backflow preventer installation by local governing utility authority.

1.06 PROJECT RECORD DOCUMENTS

A. Prepare record drawing of irrigation system with accurate locations of installed sleeving, piping, and all system components. The same design information required in the irrigation system shop drawings are required to be shown in the project record drawing.

B. OPERATION AND MAINTENANCE DATA

C. Furnish to Owner instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.

D. Program controller and furnish to Owner a recommended schedule indicating length of time each valve zone is to be open to provide appropriate amount of water for normal seasonal watering schedules.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable state and local plumbing codes for piping and component installation requirements.

B. Acquire certificate of compliance from local authority indicating approval of backflow preventer installation.

1.08 FIELD MEASUREMENTS

A. Verify that field conditions are as shown in the drawings. Revise design and record drawing as required.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Rain Bird Corporation, Turf Division: For all irrigation system equipment and accessories.

B. Hunter Industries: For all irrigation system equipment and accessories.

C. NDS: For valve boxes and drip irrigation equipment.

D. Wilkins/Zurn: For backflow preventers

2.02 MATERIALS

A. Pipe:

1. PVC in accordance with ASTM D 1785: PVC Schedule 40 pipe for all sleeving, main lines, lateral lines, and fittings throughout system. Solvent-weld sockets.
2. Rigid copper pipe required from tap at public main through back flow preventer.

B. Fittings: Type and style of connection to match pipe.

C. Solvent Cement: ANSI/ASTM D 2564 for PVC pipe and fittings.

D. Tracer Wire: 14 AWG solid copper wire with insulating cover, to be tagged as “Tracer wire” with metal tags. Color of insulating cover must be different from other wiring.

2.03 OUTLETS

A. Turf Outlets:

1. Spray Outlets: Pop-up spray bodies, 6 inch minimum to 12 inch riser heights as needed for adequate performance, with installed check valves and pressure regulating devices.
2. Rotary Nozzle Outlets: Pop-up spray bodies, 6 inch minimum to 12 inch riser heights as needed for adequate performance, with installed check valves and pressure regulating devices.
3. Stream Rotor Outlets: Pop-up stream rotor bodies, 4 inch minimum to 6 inch and/or 12 inch riser heights as needed for adequate performance, with installed check valves and internal pressure regulating devices. Rotors without internal pressure regulation may be used if combined with a pressure regulating PVC pipe swing joint.

B. Drip System Outlets:

1. Drip Line: Pressure compensating surface type installation drip line with flexible tubing, 12 inch emitter spacing, and internal emitter check valves. Anchor line with galvanized wire anchors at 24”-30” spacing. Lines and connector fittings must be capable of operating at 50 PSI without supplementary clamps.
2. Drip Emitters: Pressure Compensating drip emitters for additional water to tree placements within drip zones; one drip emitter for each ornamental size tree and two drip emitters for each medium or large size tree. Provide diffuser caps for each emitter.

2.04 VALVES & BACFLOW PREVENTERS

A. Control Valves: Electric solenoid operating valves with glass filled nylon body construction. Size valves for minimum pressure loss for designed flow rate. Provide and install pressure regulating devices for each valve placement.

B. Backflow Preventer: Wilkins/Zurn: 975XL or 975XLSEU backflow preventer sized for maximum flow in system with a maximum pressure loss limited to 10% of available residual pressure.

C. Backflow Preventer Housing: DekoRRa model 301/302, *Class I (heated and insulated) / Class II (inslulated)*, *turf green/brown granite* color, anchored to 4" minimum concrete base per manufacturer's details and specifications. *Provide hardwired power connection with receptacle in enclosure and conduit for heating element. Provide minimum size to cover with insulation bag.*

2.05 CONTROLS

A. Controller: Automatic controller for electric valve operation sized for required number of stations, with grounding per manufacturer specifications and hardwired connections to power source.

B. Controller Housing:

1. Indoor Installations: Wall mount plastic housing with lockable access door. Indoor installations must be able to accommodate wiring or wireless system remote operation of rain and heat sensing device.
2. Outdoor Installations:
    a. Wall Mount: Stainless steel housing with lockable access door.
    b. Ground Mount: Stainless steel housing and pedestal with lockable access door.

C. Accessories: include required fittings, galvanized metal electrical conduit, and accessories for installation.

D. Control Wiring: Gauge of wire to be sized by contractor for adequate operation of valves. Use waterproof connectors for all connections. Use different color wire jackets for valve power wires and white jacket for common wire.

E. System Grounding: Provide grounding at controller and throughout control wiring and valve layout to meet manufacturer's standards with grounding devices as recommended by manufacturer.

F. Rain and Heat Sensor Device: Wireless automatic, adjustable, shutoff device to disable/delay operations during or after recent rainfall and adjust watering cycle times for local heat and rainfall conditions. Provide and install connection equipment necessary for operation at controller.

2.06 OTHER EQUIPMENT

A. Swing Joints: Provide PVC pipe swing joints for all full circle rotor outlet placements.

B. Pressure Regulating Swing Joints: Provide pressure regulating PVC pipe swing joints for all rotor outlet placements without internal pressure regulation.

C. Valve Boxes and Covers: Valve boxes and covers required for all control valves, drip filters, drain valves, surge protector devices, wiring changes of direction, and wiring junctions.

D. Drip Filters: Replaceable and/or cleanable sized to match zone flows, installed with valve in valve box.

E. Drain Valves: Manual, PVC valves on tees for low points in system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify location of existing utilities. Repair utilities damaged as a result of this work at no increase in Contract Sum.

C. Verify that required utilities are available in proper location and ready for use.

D. Verify available water pressure at meter or backflow preventer locations.

E. Verify sleeve locations.

F. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Layout and stake locations of system components.

B. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system. Notify Architect/Engineer for approval of field changes to system design.

C. Coordinate location of controller, rain and heat sensor device, and connections to power source with Owner, General Contractor, and Electrical Contractor.

3.03 TRENCHING

A. Minimum Trench Depth: Trench depth must provide a minimum of 18 inches of cover over all main lines and wiring and 12 inches of cover over all lateral lines.

B. Trench to accommodate grade changes and slope to manual drain valves at low points in system.

C. Maintain trenches free of rocks, obstructions, or other debris that may damage pipe or wiring.

D. Repair or replace existing improvements damaged by work performed under this contract with equivalent materials or products.

3.04 INSTALLATION

A. Install irrigation sleeving under all pavement crossings and buried at a minimum depth of 18 inches below finish grade. All sleeving trenches must match finish grade and be compacted to minimum subgrade requirements for paving.

B. Install pipe, backflow preventer, valves, valve boxes, wiring, grounding, drains, controls, and outlets in accordance with all applicable plumbing codes, manufacturer's details, instructions, and minimum standards.

C. Trenches for irrigation main and lateral lines must match finish grade and be compacted to the degree that no settlement will occur.

D. Install cast concrete thrust blocking at all piping bends for 3 inch or larger pipe sizes.

E. Install zone valves with pressure regulating devices in valve boxes per manufacturer specifications and details. Provide metal tag with zone number for each valve.

F. After piping is installed but before sprinkler heads are installed and trenches backfilled, open valves and flush system with full head of water.

G. Install spray and rotor outlets with fittings, flex pipe, swing joints, etc. Use threaded connections to lateral lines. Install in accordance with manufacturer's details, instructions and minimum standards.

H. Install drip lines, emitters, filters, fittings, etc. in accordance with manufacturer's details, instructions and minimum standards. Anchor line with galvanized wire anchors at 3 feet on center, minimum spacing.

I. Install manual drain valves at system piping low points and pipe connections from valves to site drainage system, or, provide 12" diameter by 24" deep, gravel filled drain sumps where piped connections are not feasible.

J. Connect to water and electrical services.

K. Set outlets and box covers at finish grade elevations.

L. Install control wiring in trenches along with main lines to valves and provide 30-inch expansion coil at each valve and change of direction. Also provide 30-inch expansion coils at 100-foot intervals between valves.

M. Tracer Wire: Install tracer wire from gate valve at backflow preventer along all main lines to each zone valve. Terminate at valve boxes with 24” wire coil and metal tags labeled as “Tracer Wire.”

N. Install automatic controller. Provide hardwired connection to power source, enclose wiring to system and power source in rigid metal conduit where exposed. Paint exposed conduit to match building exterior.

O. Install rain and heat sensor device and wireless connection device to controller. Verify proper operation of device.

P. Program remote irrigation controller and install connection equipment necessary for operation at controller. Verify proper operation of remote.

Q. Repair or replace any other work or improvements damaged as a result of work related to system installation at no increase to the Contract Sum.

3.05 FIELD QUALITY CONTROL

A. Prior to backfilling and installation of outlets, cap or plug pipes and test system for leakage. Maintain maximum available pressure for one hour. Piping is acceptable if no leakage or loss of pressure occurs during test period.

3.06 ADJUSTING

A. Adjust control system to achieve time cycles required for adequate watering at time of installation.

B. Adjust heads and/or nozzles to achieve proper coverage and performance. Make nozzle or head changes as necessary for proper coverage.

C. Adjust zone valves for proper operating pressures at valve zones.

3.07 EXTRA MATERIALS

A. Furnish to Owner the following extra components:

1. Two sprinkler heads of each type and size.
2. Two nozzle inserts for each type and size.
3. Two drip emitters of each type and size
4. Two drip line basket filters of each type and size.
5. Two keys each for valve boxes and controller (if locked boxes are used).
6. Two of any required special tools for adjustment or replacement of each type of outlet, nozzle, valve, and other system equipment.

3.08 DEMONSTRATION & CLOSEOUT

A. Provide system demonstration to Owner and Architect/Engineer for review and final acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and components during service visit.

B. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

C. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

3.09 WARRANTY

A. Provide one-year materials and workmanship warranty on all system components and installation beginning on date of acceptance of the work.

B. Replace failed components immediately upon notification by Owner or Architect/Engineer.

END OF SECTION

SECTION 32 9113
SOIL PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Related Documents: The Drawings, Division 1 sections and the owner's contract requirements apply to the work under this section.

B. Work Included:

1. Provide planting media amendment.
2. Provide testing and/or certification of soils.
3. Amending of existing soil for planting.
4. Mixing of planting mediums
5. Transporting and storage of soils and planting mediums.
6. Machinery and loading restrictions.

1.02 RELATED WORK

A. Section 31 2216 – Fine Grading

B. Section 32 8410 – Landscape Irrigation System

C. Section 32 9300 - Plants

1.03 QUALITY ASSURANCE

A. Certificates of inspection: Provide those required by law for transportation, with invoice. File copies of certificates with Landscape Architect after acceptance of material. Inspection by governmental officials at point of origin does not preclude rejection of materials at project site.

B. Intent: The amendments and quantities included herein are approximate and for bidding purposes only. Following an on-site soil analysis by the Wallace Labs, El Segundo, California, 310-615-0116, composition of amendments may change. Contract price shall be adjusted accordingly.

1.04 BIDDING

A. The amendments, quantities and procedures included herein are for bidding purposes only. Following an on-site agricultural soil analysis after the rough grading, the amendments and quantities and procedures may change.

B. Tests shall be paid for by the Contractor.

C. Product Data: Submit manufacturer’s product data.

1.05 JOB CONDITIONS

A. Protection of Existing Plants to Remain: Refer to Sections 32 9300 & 32 0190.

1.06 SUBMITTALS

A. Samples and Product Data: Provide literature and samples for review and approval prior to delivery to the site.

1. Organic Amendments: 1-pint sample.
2. Chemical Additives: Literature.
3. Soil analysis and recommendations.

B. Test Data: Submit all laboratory test data for all materials.

C. Submittal Schedule: All products in this section which are required for submittal shall be included in one (1) Division 2 submittal package.

D. Protect units from damage during delivery and store under tarp when time from delivery to installation exceeds one week. Keep Hydogrow in a dark and dry location.

E. Storage: Store materials in accordance with manufacturer's instructions.

F. Handling: Protect materials during handling and installation to prevent damage.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Labeling: Furnish standard products in unopened manufacturer's standard containers bearing original labels showing quantity, analysis and name of manufacturer.

B. Storage: Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.

1.08 ANALYSIS OF SAMPLES AND TESTS

A. Sampling: Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request by Landscape Architect.

B. Rejected Materials: Remove rejected materials immediately from the site at Contractors expense.

C. Compatibility Test: Prior to review of the on-structure planting media, submit required quantity of Contractor selected media with filter for compatibility test by Owner's Testing Agency. Repeat test as necessary at Contractors cost.

D. Testing: Pay cost of testing of materials not meeting specifications.

E. Testing Agency: Wallace Laboratories, 365 Coral circle, EL Segundo, CA 80245. Tel 310-615-0116, Attn: Mr. Garn Wallace, Ph D.

1.09 FINAL ACCEPTANCE

A. Acceptance: The Landscape Architect will accept the work upon satisfactory completion of all soil preparation.

B. Notification: Notify Landscape Architect for review of soil preparation prior to proceeding with planting operations.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Definition: Topsoil shall be defined as soil material that could be used in the planting mixes for backfill of tree, shrub, and groundcover planting pits, provided it can be made to conform to the provisions included under the title "Topsoil".

B. General Qualifications: Topsoil shall be fertile, friable, well-drained soil, of uniform quality, free of stones over 1inch diameter, sticks, oils, chemicals, plaster, toxic substances, concrete and other deleterious materials, as planting medium for the project.

1. Grading:

a. Sieve size		Percent Passing Sieve
1)	25.4 mm (1")	95-100
2)	9.51 mm (3/8')	85-100
3)	53 micron (270 mesh)	10-30

2. Chemistry –Suitability Considerations:

   a. Salinity: Saturation Extract Conductivity (ECe X10³ @ 25 degrees C.) less than 4.0 sodium: Sodium Absorption Ration (SAR) less than 9.0.

   b. Boron: Saturation Extract Concentration less than 1 mg/l (parts per million).

   c. Reaction: PH of Saturated Paste: 5.5 -7.5.

C. Existing Soil to be Amended: Inspect existing soil and do all work necessary to bring it to standards specified under "General Qualification" above. Amend as specified herein.

1. This contractor shall schedule a site visit with the Landscape Architect for the purpose of obtaining a soil analysis. Samples shall be taken from three typical tree locations and delivered by the Contractor to the designated soil-testing laboratory. Submit soils analysis and recommendations to the Landscape Architect for acceptance. Soil analysis shall indicate quantities, chemical properties and recommended manufacturer or supplier.
2. Areas of existing soil to be amended shall be all areas to be planted. Modified amending without tilling is required in slope areas. Turf and grass shall receive full soil preparation.

2.02 ORGANIC AMENDMENTS

A. Compost Amendment: Acceptable products are finely ground tree and shrub trimmings and vegetable products that have been decomposed and fully composted at lease 120 days. The product shall be based upon compost. Wood residues, sawdust or shavings that have been fully composted are not acceptable. The ash content shall be at least 15% and not more than 25%. Sand content shall be less than 2%. The PH shall not be less than 5.0 or more than 7.5 the ECe shall be less than 8.0.

2.03 CHEMICAL ADDITIVES:

A. The following additives may or may not be used depending on the outcome of the soils report.
1. Ground Limestone: Agricultural limestone containing not less than 85% of total carbonates, ground to such fineness that 50% will pass #100 sieve and 90% will pass #20 sieve.
2. Dolomite Lime: Agricultural grade mineral soil conditional containing 35% minimum magnesium carbonate and 49% minimum calcium carbonate, 100%passing #65 sieve. “Kaiser Dolomite 65AG” as manufactured by Kaiser, Inc. Mineral Products Department, or equal.
3. Gypsum: Agricultural grade product containing 80% minimum calcium sulphate.
4. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20% to 30% iron and 35% to 40% sulphur.
5. Soil Sulphur: “Sul-Fe/Sulfur” as supplied by Red Star Fertilizer of Corona, CA 91720. Tel (714) 597-4801.
6. Sulphate of Potash: Agricultural grade containing 50% to 53% of water –soluble potash.
7. Single Superphosphate: commercial product containing 20% to 25% available phosphoric acid.
8. Ammonium Sulphate: Commercial product containing approximately 21% ammonia.
9. Ammonium Phosphate: Commercial product containing approximately 18% ammonia.
10. Ammonium Nitrate: Commercial product containing approximately 34% ammonia.
11. Calcium Nitrate: Agricultural grade containing 15-1/2 % nitrogen.
12. Urea Formaldehyde (N-Hro-Form): Granular commercial product containing 38% nitrogen.
13. I.B.D.U. (Iso Butyldience Diurea). Commercial product containing 31% nitrogen.
14. Soil Sulfur: Agricultural grade sulfur containing a minimum of 96% sulfur.
15. Iron Sequestrene: Geigy Iron Sequestrene 330 Fe.
16. Fr-Safe: Herbicide absorbent as manufactured by American Norit Company of Jacksonville, FL.

2.04 WATER

A. Clean, fresh and potable, furnished and paid for by Owner.

2.05 SOIL MIXES

A. Backfill Mixture for On-Grade Plant Pits: Thoroughly mix the following components into one (1cy) cubic yard of backfill mixture:
1. Amount per Cubic Yard

a. 85% by volume of on-soil soil.
b. 15% by volume of organic compost
c. ¼ pounds ammonium sulfate
d. ¼ pounds of tripe super phosphate
e. ½ pounds agricultural gypsum
f. ½ pound potassium sulfate

PART 3 EXECUTION

3.01 SOIL PREPARATION

A. General:
1. Moisture content: Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting.
2. Clearing of Debris: Clear all planting areas of stone 1 inch diameter and larger, weeds, debris and other extraneous materials prior to amending existing soil.

B. Preparation of Existing Soil:
1. Verification of Existing Grades: Verify that grades are within 1 inch plus or minus of the required finished grades. Report all variations to the Landscape Architect.
2. Clearing of Debris: Clear all planting areas of stone 2 inch diameter and larger, weeds, debris and other extraneous materials prior to amending existing soil or spreading imported topsoil.
3. Cultivation: Rip or cultivate all planting areas to a depth of 6 inches immediately prior to amending existing soil. Rototill to reduce soil clods to a maximum diameter of one (1”) inch in the top six (6) inches. Do not rototill within the existing tree areas.

3.02 SOIL CONDITIONING

A. Amending of Imported Soil:

B. Verification: Do not commence amending of soil prior to acceptance by Landscape Architect of soil preparation.

C. Application Rate: Apply to all planting areas at the following rates per 1,000 square feet:
1. 3 cubic yards organic amendment as specified.
2. 5 pounds ammonium sulfate.
3. 4 pounds triple super phosphate.
4. 10 pounds Potassium Sulfate.
5. 10 pounds agricultural gypsum.

D. Incorporation of Amendments: Incorporate thoroughly with top 6 inches of soil layer and bring amended soil to finish grades and elevations shown on Drawing. Do not work soils under muddy conditions.

E. Surface broadcast amendments at ½ the specified rate in the existing tree areas prior to hand soil conditioning or raking, do not otherwise incorporate.

3.03 DRAINAGE OF PLANTING AREAS

A. Surface Drainage:
1. Discrepancies: Provide proper surface drainage of planted areas. Submit in writing all discrepancies in the Drawings or Specifications, or prior work done by others, which Contractor feels precludes establishing proper drainage.
2. Correction: Include description of work required for correction of relief of said condition.

B. Detrimental Drainage, Soils and Obstructions:

1. Notification: Submit in writing all soils or drainage conditions considered detrimental to growth of plant materials. State condition and submit proposal and cost estimate for correcting condition.
2. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with work.
3. Obstructions: If rock, underground construction work, tree roots, or other obstructions are encountered in the performance of work under this section, submit cost required to remove the obstructions to a depth of not less than 6 inches below the required soil depth.

3.04 CLEAN UP

A. Keep all areas of work clean, neat and orderly at all times.

B. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance to the satisfaction of Landscape Architect.

END OF SECTION

SECTION 32 9221

LAWNS AND GRASSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes lawn turf and meadow mixes, complete as shown and as specified.

B. Related Work:

a. Fine Grading – Sections – 31 2216

b. Landscape Irrigation Performance Spec. – Section 32 8411

c. Soil Preparation - Section 32 9113

d. Plants – Section 32 9300

1.03 SUBMITTALS

A. Product Data: Manufacturer's current catalog cuts and specifications for

1. Incorporated fertilizer
2. Mulch
3. Slope stabilizer
4. Seed varieties
5. Sod
   a. Guaranteed statement of composition, mixture and percentage of purity and germination of each variety and mix ratios with purity and guaranteed analysis for each proposed variety or mix.
6. Erosion Control Fabric

B. Certificates:

1. Seed mix certificate including incorporated fertilizer and rate of application for hydroseeding
2. Seed Varieties

1.04 DELIVERY, STORAGE, AND HANDLING

A. Seed:

1. Delivery: Furnish standard seed in unopened manufacturer's standard containers bearing original certification labels showing quantity, analysis and name of manufacturer.

B. Sod:

1. Harvest and Delivery: Harvest from the source and deliver to project site within 24 hours. Deliver only as much sod as can be installed in one day's work.
2. Review: Sod not transplanted within this time period shall be reviewed prior to installation.

C. Mulch:

1. Labeling: Each package of cellulose fiber shall be marked by the manufacturer to show the air-dry weight content.

D. Product Storage:

1. Protect products from weather or other conditions that would damage or impair the effectiveness of the items.

1.05 PROJECT/SITE CONDITIONS

A. Climate Restrictions: Do not install lawns and grasses during rainy weather.

1.06 TIMING OF INSTALLATION

A. General:

1. Installation shall occur only when soil temperatures are conducive for germination. Verify with proposed seed mix. Advise the landscape architect where project timing will not be appropriate for the proposed or specified seed mix.

B. Hydro-mulch seeding:

1. Irrigated Areas: Within five (5) calendar days after the completion and acceptance of soil preparation and finish grading in any area and prior to any weather conditions that would affect graded areas. Regrade as required if rainfall occurs between fine grading and hydroseeding.
2. Unirrigated areas (Between May 1st and October 1st) of any calendar year.
    a. Provide temporary irrigation until material is established.

C. Installation:

Immediately after soil preparation, finish grading and irrigation installation is accepted.

1.07 WARRANTY

A. Time Period: Warrant that lawns and grasses shall be in a healthy and flourishing condition of active growth twelve (12) months from date of Final Acceptance.

B. Appearance During Warranty: Lawns and grasses shall be free of dead or dying patches, and all areas shall show foliage of normal density, size and color.

C. Delays: Delays caused by the Contractor in completing planting operations, which extend the planting into more than one planting season, shall extend the Warranty Period correspondingly.

D. Coverage: Warrant growth and coverage of hydro-mulch seeded planting to the effect that a minimum of 95% of the area planted shall be covered with specified planting after one growing season with no bare spots.

1. For Sod: Complete lush cover with no brown sections, edges, seams or cracks showing. Sod shall have established to the extent that satisfactory capillary action between the sod and soil has been established.
2. For Seed: Ninety-eight (98%) percent uniform coverage of grass in excess of one (1") inch height. No bare spots of greater than one (1) square foot and no aggregate bare areas in any 100 square feet greater than 2 square feet.

E. Exceptions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, or natural disaster during Warranty Period. Report such conditions in writing.

1.08 **FINAL ACCEPTANCE:** Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period.

1.09 QUALITY ASSURANCE:

A. Source:

1. Sod: Shall be subject to inspection and approval by Landscape Architect at the site upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Landscape Architect reserves right to refuse inspection at this time if, in his judgment, a sufficient quantity of sod is not available for inspection.
2. Seed: The Landscape Architect shall be furnished a signed copy of statement from vendor, certifying that each container of seed delivered is labeled in accordance with the Federal Seed Act and is at least equal to requirements previously specified. Seed analysis shall be furnished prior to commencement of planting operations. If data for seed reveal the seed to be below the specified pure live seed content, the Contractor shall be required to make

allowances for additional seed to compensate for the deficiency at no additional cost to the Owner.

B. Inspections:

1. Make written request for inspection after hydro-mulch seeding or sodding operations have been completed. Such inspection is for the purpose of commencement of the Landscape Establishment Period.
2. Submit written requests for inspections to the Landscape Architect at least seven (7) days prior to anticipated inspection date.

1.10 FINAL ACCEPTANCE:

A. Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period. Final Acceptance of lawn establishment shall be as follows:

1. For Sod: Complete lush cover with no bare or brown sections and no seams or cracks are showing. Sod shall have established to the extent that satisfactory capillary action between the sod and soil has been established and there are no bare areas.
2. The Landscape Architect and/or Owner shall interpret the above. Upon Final Acceptance, the Owner will assume the responsibility for maintenance of the work.

1.11 PROTECTION OF (ADJACENT) EXISTING LAWNS TO REMAIN:

A. Do not store materials or equipment, permit burning, or operate or park equipment on existing lawn areas to remain except as actually required for construction in those areas.

B. Provide barricades, fences or other barriers as necessary to protect existing lawns to remain from damage during construction.

C. Notify Landscape Architect in any case where Contractor feels grading or other construction called for by Contract Documents may damage existing lawns to remain.

D. If existing lawn areas of the same quality as this damaged at no cost to Owner. Determination of extent of damage and value of damaged lawns shall solely with Landscape Architect.

1.12 LANDSCAPE ESTABLISHMENT BY CONTRACTOR:

A. Not in Contract.

PART 2 PRODUCTS

2.01 SOD

A. As shown on the Drawings:

1. One year old Zoysia Crowne
2. One year old Zoysia Z-52

B. Sod shall be dense with the grass having been mowed at one (1”) height before lifting from field. All grown on fumigated soil.

1. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects.
2. Do not stack for more than twenty-four (24) hours between time of cutting and time of delivery.
3. Landscape Architect reserves the right to reject any sod deemed inacceptable for installation.

2.02 **SEED**:

A. All seed used shall be labeled in accordance with the U.S. Department of Agriculture Rules and Regulations under the Feder5al Seed Act. All seed shall be furnished in sealed standard containers unless exception is granted in writing by the Landscape Architect. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will bit be acceptable. The minimum percentage by weight of pure live seed in each shall be as follows and seed shall be planted at the rate per acre indicated under pure live seed required per acre.

B. Turf and Seed Mixes:

Mix	Seed	Rate/Acre	Min% Live Seed
ECS-"MEADOW MIX"			
Common Name			
Bamert Seed Co Deluxe Prairie		30 lbs.	100%
Bamert Seed Co Quick Cover Blend		20 lbs.	100%

Note: % Pure Live Seed = % Purity X % Germination

C. Weed seed shall not exceed one (1%) percent by weight of the total of pure live seed and other material in the mixture. Johnson grass, Bermuda grass in St. Augustine lawn, nut grass, and other noxious weed seed will not be allowed.

2.03 FERTILIZER FOR TANK MIX:

A. Shall be as established through soil testing, pelleted, uniform in composition, free flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags, or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name or trademark and warranty of the producer.

2.04 FIBER MULCH:

A. Fiber mulch, for use with hydraulic application of grass seed and fertilizer, shall consist of specially prepared mulch. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed and appropriate color to allow visual metering of its application. The mulch shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air-dry weight of the fiber, a standard equivalent to eighteen (18%) percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry we4ight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that it meets all of the foregoing requirements.

B. Soil Stabilizer:

1. Composition: Totally organic substance, supplied in powder form and at least 90% of which is 92% pure muciloid derived from ground Plantago ovate-insularis husks. Stabilizer shall be water-soluble, non-toxic hydrophilic and shall not inhibit germination.
2. Product: "Ecology Controls M-binders" by Ecology Controls (213) 877-8600, or "R-Binder" by Clyde Robin Seed Co., (415) 785-0425.

C. Mulch and Soil Stabilizer:

1. Composition: Pre-mixed, organic-based combination of virgin-wool fiber and stabilizing agent with no growth or germination –inhibiting elements.
2. Product: "Hydro Mulch 2000 Fiber" by Conwed Corporation., (612) 221-1190.

2.05 SLURRY MIX COMPONENTS PER ACRE:

A. Fiber Mulch 2,000 Pounds (with stabilizer where slopes to be hydromulch seeded in excess of 3:1 exist)

B. Grass Seed As Specified

C. Fertilizer Organic fertilizer additive as specified under soil preparation.

2.06 TOPSOIL AND SAND:

A. Topdressing material for sod joints:

1. Blend

a. 1/3 Cubic Yard Sandy Loam Topsoil (75%)

b. Compost (25%)

c. Fertilizer according to the soil report recommendations

2.07 LAWN FERTILIZER FOR EXISTING LAWN:

A. Shall be as specified in the Landscape Establishment Specification Section 02935 or as recommend by the project agronomist during the soil testing and recommendations portion of Soil Preparation Section 32 9221.

2.08 **WATER**: Shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass. The water source shall be subject to approval prior to use.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Grades: Verify that grades are within 1 in. plus or minus of the required finished grades. Report all variations in writing.

2. Stones, Weeds, Debris: Verify that all areas to receive turf and meadow grass mix are clear of stones larges that 1 inch diameter, weeds, debris and other extraneous materials.

3.02 PREPARATION

A. Excessive Soil Moisture: Do not commence work of this section when soil moisture content is so great that excessive compaction will occur.

B. Inadequate Soil Moisture: Apply water, as necessary, to bring soil to an optimum moisture content for planting. Do not work soil when it is so dry that dust will form in air or that clods will not break readily.

C. Cultivation of Slopes: Only planting areas of 2:1 slopes and greater shall be ripped or cultivated to a depth of 3 in. immediately prior to hydroseeding. See Section 32 9113 “Soil Preparation”

D. Cultivation of turf and meadow areas: Where soil is compacted or under construction traffic, rip soil a minimum of 6 inches deep to mitigate surface compaction. Rototil and cultivate to 3 inch depth. Fine grade to the grades indicated.

E. Hydroseeding of Non-irrigated Grass/Wildflowers Areas: Dates as approved and dependent on seed mix specified.

F. Erosion Control Fabric: See Division 2, Section “Erosion Control”.

3.03 SODDING ON PREPARED FINISHED GRADE:

A. Bed Preparation: Immediately after soil preparation is completed and finished grade has been approved, begin sodding operations. If sod bed is dry immediately prior to sod growth. Id sod bed is dry immediately prior to sod installation, dampen surface with a fine mist of water.

B. Installation:

1. Lay sod so that adjacent strips butt tightly with no spaces between strips. Lay sod on mounds and slopes with strips parallel to contours. Stagger joints.

2. Tamp and roll sod thoroughly to make contact with sod bed.

3. Peg Sod on slopes three to one or steeper with pegs driven through sod into soil until pegs are flush with turf. Space pegs eighteen (18”) inches on center. Pegs to be one (1”) inch square by six (6”) inches Pine or six (6”) inches lengths of lath.

4. Water sod thoroughly immediately after fertilization.
5. Immediately after installation of the sod, remove sod clumps and soil, wash off any plant materials and pavements not to have sod. Keep areas clean during the maintenance period.

3.04 SPECIAL MULCHING EQUIPMENT:

A. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood fiber mulch shall have a built-in agitation system with and operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to forty (40) pounds of fiber plus a combined total of seventy (70) pounds of fertilizer solids for each on hundred (100) gallons of water. The slurry on the slopes distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum, capacity of eight hundred (800) gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The Landscape Architect may authorize equipment with smaller tank capacity to spray the slurry in a uniform coat.

B. Mixing: Care shall be taken that the slurry preparation takes place on the site of the work. The slurry preparation should begin by adding water to the tank when the engine is at half throttle. When the water level has reached the height of the agitator shaft, good recirculation shall be established and seed shall be added. Fertilizer shall then be added, followed by wood pulp mulch. The wood pulp mulch shall only be added to the mixture after the seed and when the tank is at least one-third filled with water. The engine throttle shall be opened to full speed when the tank is half filled with water. All the wood pulp mulch shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence immediately when the tank is full. The operator shall spry the area with a uniform, visible coat by using the green color of the wood pulp as a guide.

C. Application:

1. Contractor shall obtain approval of hydromulch area preparation form the Landscape Architect prior to application.
2. Operators of hydroseeding equipment shall be thoroughly experienced in this type of application. Apply Specified slurry mix in a motion to form a uniform mat as specified rate.
3. Keep hydromulch within areas designated and keep from contact with other plant materials.
4. Slurry mixture which has not been applied within four (4) hours of mixing shall not be used and shall be removed from the site.
5. After application, the Contractor shall not operate any equipment over the covered area.
6. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.
7. Refer also to the maintenance portion of this Section.

D. Unseeded Areas: If, in the opinion of the Landscape Architect, unplanted skips and areas are noted after hydroseeding, the Contractor shall be required to seed the unplanted areas with the grasses that were to have been planted at no additional cost to the Owner.

3.05 HYDROMULCH SEEDING ON PREPARED FINISHED GRADE:

A. Bed Preparation: Begin hydro-mulch seeding operations immediately after soil preparation, excluding the incorporation of fertilizer, and the finished grade has been approved.

3.06 SODDING ON PREPARED FINISHED GRADE:

A. Bed Preparation: Immediately after the soil preparation is completed and finished grade has been approved, begin sodding operations to reduce excessive weed growth. If sod bed is dry

immediately prior to sod growth. If sod bed is dry immediately prior to sod installation, dampen surface with fine mist of water.

B. Installation:

1. Lay sod so that adjacent strips butt tightly with no spaces between strips of edges. Lay sod on mounds and slopes with strips parallel to contours. Stagger joints. Sodded areas shall be flush with adjoining seeded areas.
2. Cut back edges at pavement approximately 18 inches wide, tapering from below the walk to finish grade such that the edge of the top of sod soil will be flush to ½ inch low at the pavement and transition to finish grade.
3. Tamp and roll sod thoroughly to make contact with sod bed.
4. Peg sod on slopes three to one or steeper with pegs driven through sod into soil until pegs are flush with turf. Space pegs eighteen (18”) inches on center. Pegs to be one (1”) inches square by six (6”) inches Pine or six (6”) inch in lengths of lath.
5. Water sod thoroughly immediately after planting.
6. Immediately after installation of the sod, remove sod clumps and soil, wash off any plant materials and pavements not to have sod. Keep all areas clean during the maintenance period.

3.07 **SITE OBSERVATIONS**:

A. Make written request for review by the Landscape Architect (Owners Representative) prior to seeding and after areas have been seeded and sodded.

B. Submit requests for inspections to Landscape Architect at least two (2) days prior to anticipated inspection date.

3.08 CLEANUP

A. General: Keep all areas of work clean, neat and orderly at all times. Keep all paved areas clean during planting operations.

B. Debris: Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

C. Erosion: Immediately restore eroded areas. Keep all adjacent paved surfaces cleaned of dirt, mud or stains and organic debris.

D. Hydroseed Overspray: Immediately after application, thoroughly wash off slurry from all materials and surfaces not designated to receive slurry hydroseed mix.

END OF SECTION

SECTION 32 9223

SODDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide solid sodding for erosion control where shown on Drawings.

1.02 RELATED WORK

A. Section 31 2216 Fine Grading

B. Section 32 8411 – Landscape Irrigation System Performance Specification.

C. Section 32 9300 - Plants

1.03 REFERENCES

A. Federal Specifications (FS):

1. FS-O-F-241 – Fertilizers, Mixed, Commercial.

1.04 QUALITY ASSURANCE

A. American Sod Producers Association (ASPA) – Guideline Specifications to Sodding.

1.05 SUBMITTALS

A. Submit results of soil analysis of samples taken from existing and/or imported topsoils.

B. Submit certification of sod type from grower and delivery receipt to contractor at the project address.

C. Submit samples of sod to Architect/Engineer for approval prior to installation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver fertilizer in waterproof bags showing new weight, chemical analysis, and name of manufacturer.

1.07 PRICES

A. Solid Sodding: Sodding in place as specified in this section and shown on the Drawings. Payment will be made at the lump sum bid for “Solid Sodding”, which price shall be full compensation for subgrade preparation, sod, lime, fertilizer, and water, including all labor, tools, equipment and incidental necessary to complete the work.

B. Topsoil: Imported topsoil incorporated into Work as specified in this section and shown on the drawings. Payment will be made at the lump sum price bid for “Topsoil”, which price shall include all costs of purchasing the loading, hauling, dumping, and spreading topsoil at the site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil:

1. Existing Topsoil: Natural, fertile agricultural soil capable of sustaining vigorous plant growth, not frozen or muddy condition, containing not less than 3% organic matter, and corrected to PH valve of 5.9 to 7.0. Free from sub-soil, slag, clay, stone, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.

2. Imported Topsoil: Natural, fertile agricultural soil typical of locality, capable of sustaining vigorous plant growth, from well-drained site free of flooding, not frozen or muddy condition, not less than 3% organic matter, and PH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.

3. Have topsoils analyzed and submit written analysis stating the nitrogen, phosphorous, and potassium requirements, organic matter content, and ph value of the soil. Provide soil amendments as recommended by soils analysis for proposed turf grasses.

4. Testing Agency: Wallace Laboratories, 365 Coral circle, EL Segundo, CA 80245. Tel 310-615-0116, Attn: Mr. Garn Wallace, Ph D.
5. Very fine sandy loams and silt loams are not allowed.
6. Incorporate 15% compost by volume into existing and/or imported topsoil prior to planting or backfill mix preparation.

B. Fertilizers: FS O-F-241 commercial type:

1. Proportions: 10N-20P-10K, or as recommended by soils analysis. Provide fertilizer application as recommended by soils analysis.

C. Lime: Lime if required, shall be agricultural grade ground limestone ground to pass an 8-meshed sieve with 25 percent passing a 100-meshing sieve. Calcareous limestone shall contain not less than 50 percent calcium oxide, and dolomitic limestone shall contain not less than 40 percent magnesium oxide. Coarser materials will be accepted provided the specified rates of application are increased proportionality; on the basis of quantities passing the 8 and 100 mesh sieves, but no additional payment will be made for the increase quantity. Provide line application as required by soils analysis.

D. Sod: Conforming to ASPA Guideline.

1. Type: As specified in the Turf Materials list on the drawings.
2. Use certified nursery grade cultivated grass sod, 98% weed free.
3. Content: Strong fibrous root system and free from stones and burned or bare spots.

E. Water: Water shall be of irrigation quality and free of impurities that would be detrimental to plant growth.

PART 3 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Fine grade subgrade, eliminating uneven areas and low spots. Maintain lines, levels, profiles and contours, allowing for thickness of topsoil and sod. Make changes in grade gradual. Blend slopes into level areas. Allow for positive drainage.

B. Remove foreign materials, undesirable plants, and their roots, stones, and debris. Do not bury foreign material beneath areas to be sodded. Remove subsoil which has been contaminated with petroleum or chemical products.

C. Cultivate subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted topsoil for proposed plant materials.

D. Prepare subgrades and bedding areas to receive plant materials.

3.02 PLACING TOPSOIL

A. Spread topsoil to the minimum depth stated on the drawings over all areas to be sodded.

B. Place topsoil during dry weather and on dry, unfrozen subgrade.

C. Rake until surface is smooth.

D. Remove stones, roots, grass weeds, debris, and other foreign non-organic material while spreading.

E. Lightly compact area after application of lime and fertilizer.

3.03 LIME APPLICATION

A. Spread lime at the rate recommended by soil analysis-lime requirement testing.

B. Mix lime thoroughly into topsoil layer.

3.04 FERTILIZING

A. Apply fertilizer at a rate of 800 pounds per acre or as recommended by soils analysis. Apply after fine grading and prior to compaction. Mix thoroughly into upper two inches of topsoil.

B. Lightly water to aid the breakdown of fertilizer.

C. Apply fertilizer within 48 hours before laying sod.

3.05 LAYING SOD

A. Lay sod within 24 hours after delivery to prevent deterioration.

B. Lay sod closely knit together with no open joints visible, and pieces not overlapped. Lay smooth and flush with adjoining grass areas, paving and top surfaces of curbs.

C. On slopes 2.5:1 and steeper, lay sod perpendicular to slope and secure every row 6-inch long metal staples at maximum 2 feet on center. Dive metal staples flush with soil portion of sod.

D. Immediately water sodded areas after installation. Water in sufficient amounts to saturate sod and upper 4 inches of soil.

E. After sod and soil has dried sufficiently to prevent damage, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Ensure rolling equipment weight is not over 250lbs. or less than 150lbs.

3.06 MAINTENANCE SERVICE

A. Begin maintenance services of sodded areas immediately after installation and continue throughout construction period until final acceptance of work.

B. Establish and maintain turf in a vigorous healthy growing condition. Include the following items:

1. Mowing turf as necessary to maintain a height of grass above ground between 2 and 4 inches.
2. Water sufficient to saturate root system.
3. Weed control applications.
4. Disease and insect control.
5. Fertilize every 30 days following initial application and installation.

END OF SECTION

SECTION 32 9300

PLANTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Trees, plants, and ground cover.

B. Tree pit and plant bed preparation.

C. Temporary support.

D. Maintenance service.

1.02 RELATED WORK

A. Section 31 2216 Fine Grading

B. Section *32 8411* - Landscape Irrigation System *Performance Specification.*

C. Section 32 9223 - Sodding

1.03 QUALITY ASURANCE

A. Perform work with personnel experienced in the work required of this Section under direction of a skilled foreman.

B. Plant material: American Association of Nurserymen, Inc. Standards.

1. Grading tolerances allowed: As specified in the American Standard for Nursery Stock, latest revised edition.

2. Material shall be free from disease and insect infestation.

1.04 SUBMITTALS

A. Submit samples of plant materials to Architect/Engineer for approval prior to installation.

B. Submit a five-pound sample of prepared backfill mixture. If an alternate pre-mixed type is proposed, then submit sample and mix contents by proportion.

C. Submit a five-pound sample of mulch material.

D. Submit results of soils analysis for exiting and/or imported topsoils used in backfill mixture, and existing subgrade soils.

1.05 REFERENCES

A. Federal Specification (FS): FS O-F-241 –Fertilizer, Mixed Commercial.

1.06 DELIVERY, STORAGE AND HANDLING

A. Move balled and burlapped stock only when root balls are solid and well hardened.

B. Deliver plant materials immediately prior to placement. Keep root balls of plant material moist.

C. Reject plants when root ball has been cracked or broken prior to or during process of planting.

D. Reject plants when burlap, staves, and ropes required in connection with transplanting have been displaced prior to acceptance.

1.07 WARRANTY

A. Provide one-year warranty from date of final acceptance of the work.

B. Immediately replace plant materials found dead, or not in healthy growing condition during warranty coverage.

C. Replacements: Plant materials of same size and species, with a new warranty commencing on date of replacement.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil:

1. Existing Topsoil: Natural, fertile agricultural soil capable of sustaining vigorous plant growth, not frozen or muddy condition, containing not less than 3% organic matter, and corrected to PH valve of 5.9 to 7.0. Free from sub-soil, slag, clay, stone, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.
2. Imported Topsoil: Natural, fertile agricultural soil typical of locality, capable of sustaining vigorous plant growth, from well-drained site free of flooding, not frozen or muddy condition, not less than 3% organic matter, and PH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.
3. Have topsoils analyzed and submit written analysis stating the nitrogen, phosphorous, and potassium requirements, organic matter content, and ph value of the soil. Provide soil amendments as recommended by soils analysis for proposed plant materials.
4. Testing Agency: Wallace Laboratories, 365 Coral circle, EL Segundo, CA 80245. Tel 310-615-0116, Attn: Mr. Garn Wallace, Ph D.
5. Very fine sandy loams and silt loams are not allowed.
6. Incorporate 15% compost by volume into existing and/or imported topsoil prior to planting or backfill mix preparation.

B. Fertilizers:
1. FS O-F-241 commercial type: Proportions as per U.S. Dept. of Agriculture Extension Service recommendation from analysis of samples.
2. Fertilizer: AGRIFORM planting tablets by Sierra chemical Company, or approved equal.

a. Trees and Shrubs: 21 gram planting tablet.
b. Liner size plants: 10 gram planting tablet.
c. Ground cover, each plant: 5 gram planting tablet.

C. Trees, Shrubs, and Ground Cover:
1. Refer to Plant Materials list on Drawings.
2. Furnish either balled and burlapped or container grown stock.

D. Backfill Mixture:
1. One part imported topsoil, one part sand, and one part “Back to Earth Compost Blend” mixed and lightly compacted in place. Fills over 6 inches in depth must be watered in. Mix in 6 pounds of “Watersorb” per 100 square feet of planted bed surface area when placing backfill mixture.

E. Weed control:
1. Anti-germination weed control agent, EPTAM, or approved equal. Place under mulch in shrub and groundcover beds at manufacturer’s recommended rates.

F. Plant Growth Stimulator:
1. Water all plants at installation with a liquid from root stimulator. Saturate planting holes thoroughly.

G. Mulch Material:
1. Shredded Hardwood bark with no hardwood chips, limbs or other foreign material.

H. Steel Edging:
1. See Edging Material Remarks on Plans

2.02 ACCESSORIES

A. Wrapping Materials: Quality burlap.

B. Tree anchoring materials in accordance with tree anchoring method specified in drawings.

PART 3 EXECUTION

3.01 PREPARATION, GENERAL

A. Verify that the site is ready to receive the work of this Section.

B. Prepare subgrades and bedding areas to receive plant materials.

C. Enclose all open plan bed edges with steel edging. Do not place edging along backs of curbs or pavements.

3.02 PREPARATION OF SUBGRADE

A. Remove foreign materials, undesirable plants and their roots, stones and debris. Do not bury foreign material beneath areas to be backfilled and planted. Remove subsoil which has been contaminated with petroleum or chemical products.

B. Excavate ground cover and annual beds to the minimum depth below finish grade required for the backfill mixture layer depth specified in the drawings.

C. Excavate tree and plant pits as shown in the drawings, allowing for depth of root ball and proper finish grade at top.

D. Cultivate sub-soil to a depth of 3 inches where backfill mixture to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.

3.03 PLACING BACKFILL

A. Mix any granular fertilizers thoroughly with backfill mixture prior to backfilling.

B. Backfill plant pits with backfill mixture mounded to finish grade when installing plants.

C. Backfill ground cover and annual beds to finish grade with the minimum layer depth stated on the drawings for backfill mixture.

D. Backfill other bed areas to finish grade with the minimum layer depth of topsoil as specified in the drawings.

E. Place topsoil and prepared backfill mixture during dry weather and on dry, unfrozen subgrade.

F. Grade bed areas to eliminate rough and low areas, ensuring positive drainage. Maintain levels, profiles and contours of subgrade.

3.04 INSTALLATION OF PLANT MATERIALS

A. Place plant materials for review and final orientation by Architect/Engineer prior to installation.

B. Handle nursery stock in accordance with good nursery practice. Protect tree trunks from damage to bark and replace any trees with bark damage.

C. Scarify walls and bottoms of planting pits where soil is compacted or glazed.

D. Place trees and shrubs in pits and backfill with prepared backfill mixture. Place ground Covers and annuals in beds backfilled with prepared backfill mixture.

E. Tablet Fertilizing:

1. Place one planting tablet in each planting hole, using the proper size for each type of planting:

a. Trees and shrubs: 21 gram.

b. Liner size plants: 10 gram.

c. Ground Cover plants: 5 gram

2. Place tablet so as not to physically interfere with the existing roots at the time of planting.

3. Laterally, place tablet just about one inch beyond the existing root system where feeder root development will occur.

F. Stabilize trees over 5-feet height in upright position in accordance with tree anchoring method specified in drawings.

G. Apply weed control agent to finished grade of planted bed areas prior to installing mulch material.

H. Apply liquid from root stimulator with initial watering.

I. Provide 3-inch minimum settled layer depth of mulch in all planted beds and around the base of all newly planted trees.

J. Maintain plantings throughout construction period until date of final acceptance.

3.05 MAINTENANCE SERVICE

A. Begin maintenance of tree and shrub plantings immediately after planting and continue throughout construction period until final acceptance of work.

B. Maintenance shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition, including the following items:

1. Cultivation and weeding plant beds and tree pits. When herbicides are used for weed control, apply in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
2. Water sufficient to saturate root system.
3. Pruning, including removal of dead or broken branches, shaping and treatment of prune wounds.
4. Disease and insect control.
5. Maintenance of tree anchors. Adjust repair or replace as required to maintain trees in upright positions.
6. Replace mulch and backfill mixture and/or topsoil after washouts.
7. Immediately replace plant material found dead or not in healthy growing condition.
8. Fertilize trees, shrubs and ground covers every 30 days after installation.

END OF SECTION

SECTION 33 4000

STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe culverts.

B. Concrete curb inlet structures and junction boxes.

C. Connection to existing concrete drainage structures.

D. Pipe material noted on plans may not be substituted by any other material.

1.02 RELATED WORK

A. Section 31 2000 – Earth Moving

B. Section 32 0523 – Cement and Concrete for Exterior Improvements.

C. Section 32 1613 – Concrete Curb and Gutters.

D. Section 33 0516 – Manhole and Structures.

1.03 SUBMITTALS

A. See Related Work

PART 2 PRODUCTS

2.01 PIPE CULVERTS

A. Reinforced Concrete Pipe (RCP): ASTM C76-78, Class III.
   1. Material: Concrete and reinforcing steel.
   2. Shape: Circular.
   3. Sizes: As shown on Drawings.

B. Joint Material:
   1. Cold-applied preformed plastic gasket type sealant conforming to Federal Specification SS-5-00210.
   2. Primer: As specified by the manufacturer.

C. Polymer Coated Corrugated smooth interior Steel Pipe (CMP): AASHTO M36 and AASHTO M218:
   1. Material: Steel (polymeric pre-coated galvanized type B 10mil both sides).
   2. Type: Corrugated w / ¾" x ¾" x 7½ " external ribs in accordance w/ ASTM A760.
   3. Sizes: As shown on Drawings.

D. Corrugated Polyethylene Pipe (CPEP): AASHTO M 294 or ASTM F 2648 for LEED Projects.
   1. Material: Virgin Polyethylene compounds, uniformly pigmented, with no cracks or creases. The pipe shall have a minimum pipe stiffness at five percent deflection as follows when tested in accordance with M 294 or F 2648:

Diameter (in)	Pipe Stiffness (psi)
12	45
15	42
18	40
24	34
30	28
36	22

   2. Type: "S" – Full circular cross-section with an outer corrugated wall and a smooth inner wall.
   3. Sizes: As shown on drawings.

E. Couplings for CPEP

1. Couplings shall be corrugated to match the pipe corrugations and shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Couplings shall be bell and spigot, split collar, or screw–on collar.

2.02 PIPE AND VALVES FOR FUEL CONTAINMENT

A. Pipe used for fuel containment when shown on plan:
   1. Ductile Iron Pipe.
B. Valves for fuel containment when shown on plan:
   1. See Section 33 1219
      a. shall contain “Buna N” NBR (nitrile butyl rubber)

2.03 CURB INLET STRUCTURE AND JUNCTION BOX

A. Concrete and reinforcing steel:
   1. Refer to Standard Detail.
   2. Refer to Section 32 0523 and ACI 301.
B. Manhole rings and covers: ASTM A48, Class 30A, Type II Traffic safe.
   1. Material: Cast Iron, solid cover.
   2. Size 24-inch diameter with ring depth equal to concrete thickness.

2.04 BEDDING AND BACKFILL MATERIALS

A. Select Backfill Materials: soil excavated from trench or sub-soil from site that is free of rocks larger than 1-1 ½ inches in greatest dimension, and free from frozen soil, large clumps of soil, muddy soil, organic matter and foreign materials.
B. Class I Bedding Material: Angular, graded stone, ¼ inch to 1½ inch size.

PART 3 EXECUTION

3.01 CONCRETE PIPE CULVERT INSTALLATION

A. Excavate and backfill the trench in accordance with the provision of Section 33 05 16
B. Grade the bottom of the trench to provide a firm bedding surface of uniform density along the entire length of the pipe.
C. Shape the bottom of the trench to conform to the bottom one quarter of the outside diameter of the circular pipe.
D. Lay the pipe beginning at the downstream end with the groove end of the pipe placed facing upstream.
E. Join pipe using specified cold applied preformed plastic joint sealant. Clean the pipe joint surface and prime, if recommended by the manufacture, brush on and allow to dry. Remove protective wrapping from one side of the rope. Lay rope strip side up on the surface of the pipe joint and press the strip firmly to surface of pipe joint end-to-end continuing around the entire circumference of the joint. Remove the remaining protective wrapping and force pipe into connection until material fills the joint space.
F. To insure an even and well-filled joint, accomplish the final joining of the pipe by either pushing or pulling by mechanical means each joint of the pipe as it is laid.
G. In cold weather, either warm the joint material in a hot water bath, or by other approved methods, to the extent required to keep the material pliable for placement without breaking or cracking, or use butyl rubber type joint sealant.
H. In areas not under pavement of structure “Slice-in” the bedding material under the haunches of the pipe with and then hand tamp or mechanical tamp the backfill up to the horizontal centerline of the pipe.
I. Under pavement and structures, compact the backfill on the sides of the pipe to the required densities specified in Section 31 2000 using mechanical tamps with the top 12 inches of subgrade compacted to 95% of the soils Modified Proctor maximum dry density at or near the optimum moisture content.

3.02 CORRUGATED POLYETHLENE PIPE CULVERT INSTALLATION

A. Excavate subsoil to depth and grade line as required for proper installation of the culvert pipe. Keep trench as narrow as possible but sufficiently wide to permit tamping under the haunches and installation of connecting band when sections are joined. Keep sidewalls as vertical as possible, at least to an elevation above the top of the pipe.
B. Grade bottom of trench to provide a firm bedding surface of uniform density along the entire length of the pipe. Remove rock or soft, unstable material encountered at the excavated grade line to a minimum depth of 6 inches and replace with Class I bedding material.
C. Shape bottom of trench to conform to bottom one quarter of the outside diameter of the circular pipe and up to the widest part of arch pipe, allowing a uniform blanket of loose material to cover the shaped bedding to a depth sufficient to allow the corrugations to be filled with the material.
D. Place corrugated metal pipe on bedding with longitudinal laps or seems, if any, at the sides. To assemble sections of pipe, place corrugated connecting band around or under the first pipe, then lay the second pipe section with the corrugations matching and the adjacent ends butting together. Keep dirt and gravel out of joint so that corrugations fit snugly. Fasten bolts on band tightly and uniformly.
E. Place backfill material in 4 inch layer haunches alternately on both sides of pipe, using Class I bedding material. Slice-in with a shovel under the haunches to eliminate voids. Using select backfill material, place material in 6 inch lifts alternately on each side of pipe up to widest part at arch pipe, and using hand tamps or mechanical tampers, compact each lift to a minimum of 90% of optimum density for the material as determined by Modified Proctor procedures, ASTM D-1557. If Class I bedding material is used, place the material in such manner as to eliminate voids and consolidate and interlock the material to form a stable side support for the pipe.
F. In locations not in traffic areas, hand place select backfill to a level 12 inches above the top of the pipe in such manner as to minimize voids, unless otherwise noted on the plans. Backfill up to surrounding ground surface or finished subgrade with subsoil containing no rocks or boulders large thank 6 inches in greatest dimension within 12 inches of the subgrade. Leave top of backfill slightly mounded to allow for settlement.
G. Under traffic areas, backfill trench from horizontal centerline of pipe up to top of subgrade using either select backfill material or Class I bedding material. If select backfill material is used, place material in 6 inch lifts and compact with mechanical tamps. Compact each layer to within 24 inches of subgrade to 90% of optimum density for the material as determined by Modified Proctor procedures, ASTM D-1557. Compact the remaining 24 inches to subgrade to 95% of optimum density using the same procedures. If Class I bedding material is used, place the material in such manner as to minimize voids and interlock the material to form a stable fill that will support the pavement structure and subsequent traffic loads.
H. Patch cut edges and surface-damaged areas with specified patching material to restore protection to metal surface originally provided by polymer coating.

3.03 CONCRETE STRUCTURES INSTALLATION

A. Forming concrete, placing reinforcing steel and placing and curing concrete: Refer to Section 32 05 23 and ACI 301.
B. Excavation and Backfill: Refer to Section 33 0516.

3.04 EXISTING STRUCTURE MODIFICATION

A. Remove top and throat of existing curb inlet.
B. Remove loose and damaged concrete material.
C. Dispose of removed material including cast iron ring and cover.
D. Cut and tie reinforcing steel to new steel as detailed on Drawings.
E. Form new top and provide new cast iron ring and cover.

F. Place steel as detailed on Drawings and place concrete to modify structure into a junction box.
G. Patch inside face of wall to achieve smooth surface.

END OF SECTION