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PROJECT MANUAL

95% REVIEW SET

PRELIMINARY – NOT FOR CONSTRUCTION

Bus Maintenance Facility
Southeast Polk Community School District
8415 NE University Avenue, Pleasant Hill, IA 50327

Volume 1 of 1

Date: September 3, 2025

Project No.: 3007.090.00

SECTION 00 01 01 – PROJECT TITLE PAGE

PROJECT:	**Bus Maintenance Facility** Southeast Polk Community School District 8415 NE University Avenue, Pleasant Hill, IA 50327 RDG No.: **3007.090.00**
OWNER:	**Southeast Polk Community School District** 8031 NE University Avenue, Pleasant Hill, IA 50327 Contact: Kevin Baccam, Chief Financial Officer | kevin.baccam@southeastpolk.org | 515.957.4294
DATE:	September 3, 2025
ARCHITECT:	**RDG Planning & Design** 301 Grand Avenue, Des Moines, Iowa 50309 Phone: 515.288.3141 Contact: Kylan Block | kblock@rdgusa.com | 402.449.0815
LANDSCAPE ARCHITECT:	**RDG Planning & Design** 301 Grand Avenue, Des Moines, Iowa 50309 Phone: 515.288.3141 Contact: Jason Blome | jblome@rdgusa.com | 515.473.6360
CIVIL ENGINEER:	**RDG Planning & Design** 301 Grand Avenue, Des Moines, Iowa 50309 Phone: 515.288.3141 Contact: Greg Pierce | gpierce@rdgusa.com | 515.309.3277
STRUCTURAL ENGINEER:	**Raker Rhodes Engineering** 4717 Grand Avenue, Des Moines, IA 50312 Phone: 515.277.0275 Contact: Todd Chingway | tchingway@rakerrrhodes.com | 515.321.1702
MECHANICAL ENGINEER: **PLUMBING ENGINEER:**	**MODUS** 1717 Ingersoll Avenue, Des Moines, Iowa 50309 Phone: 515.251.7280 Contact: Joe Townsend | jtownsend@modus-eng.com |
ELECTRICAL ENGINEER:	**MODUS** 1717 Ingersoll Avenue, Des Moines, Iowa 50309 Phone: 515.251.7280 Contact: Erik Francois | efrancois@modus-eng.com |

END OF DOCUMENT 00 01 01

SECTION 00 01 05 – CERTIFICATION PAGE

CIVIL

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed professional engineer under the laws of the State of Iowa.

GREGORY M. PIERCE, P.E. IOWA LIC No. **16321**
Printed or typed name

09.03.2025
Signature Date
Expiration Date: DECEMBER 31, 2025

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

LANDSCAPE ARCHITECTURAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed professional landscape architect under the laws of the State of Iowa.

JASON BLOME, ASLA IOWA LIC No. **00575**
Printed or typed name

09.03.2025
Signature Date
Expiration Date: JUNE 30, 2027

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

ARCHITECTURAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed architect under the laws of the State of Iowa.

NAURA HEIMAN GODAR, AIA IOWA LIC No. **05896**
Printed or typed name

Signature Date
Expiration Date: JUNE 30, 2026

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

STRUCTURAL

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed professional engineer under the laws of the State of Iowa.

ERIK RAKER, P.E. IOWA LIC No. **17922**
Printed or typed name

09.03.2025
Signature Date
Expiration Date: DECEMBER 31, 2025

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

MECHANICAL/PLUMBING/FIRE PROTECTION

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed professional engineer under the laws of the State of Iowa.

HOLLY M. STEVENS, P.E. IOWA LIC No. **20288**
Printed or typed name

Signature Date
Expiration Date: DECEMBER 31, 2026

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

ELECTRICAL

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed professional engineer under the laws of the State of Iowa.

JOSHUA L. NIELSEN, P.E. IOWA LIC No. **19516**
Printed or typed name

Signature Date
Expiration Date: DECEMBER 31, 2026

Pages or sheets covered by this seal: Date Issued:
Project Manual pages identified in Table of Contents. **03 SEP 2025**

END OF SECTION 00 01 05

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Southeast Polk Community School District
8415 NE University Avenue, Pleasant Hill, IA 50327
RDG No. 3007.090.00

OWNER: **Southeast Polk Community School District**
8031 NE University Avenue, Pleasant Hill, IA 50327

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01 GEOTECHNICAL EXPLORATION REPORT

Abbreviation	Company Name	Discipline:
CIVIL	RDG Planning & Design	Civil Engineering Consultant
LA	RDG Planning & Design	Landscape Architectural Consultant
STRUC	Raker Rhodes Engineering	Structural Consultant
ARCH	RDG Planning & Design	Architectural Consultant
MECH	MODUS	Mechanical Consultant
ELEC	MODUS	Electrical Consultant
OWNER	Southeast Polk Community School District	Owner

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SECTION 00 11 13 **– NOTICE TO BIDDERS**

Sealed bids for the Southeast Polk Community School District Bus Maintenance Facility, will be received by Southeast Polk Community School District at Southeast Polk Community School District Board Room, 8031 NE University Avenue, Pleasant Hill, IA 50327 until 2 PM local time on September 30, 2025 and will be publicly opened and read aloud for the following public improvements:

New construction of a bus maintenance facility. Work includes related mechanical and electrical construction, site development, site utilities, and site paving.

Bids will be received for a single prime contract.

Bidding documents may be examined at the following places:
Construction Update Network: www.mbionline.com
Beeline + Blue: www.beelineandblue.com
Omaha Builders Exchange, 4159 South 94th Street, Omaha, NE 68127
Minneapolis Builders Exchange, 1123 Glenwood Ave, Minneapolis, MN 55405

Bidding Documents may be obtained from Beeline + Blue, 2507 Ingersoll Avenue, Des Moines, IA 50312; Phone: (515-244-1611) or through their on-line plan room at www.beelineandblue.com.
Plan deposit, of $100.00 per set, will be returned to Bidder when bid documents are returned in good condition. Members of Associated Builders and Contractors of Iowa may obtain Bidding Documents by use of the non-cash security method adopted by the ABC of Iowa. Members of Master Builders of Iowa may obtain Bidding Documents by use of the non-cash security method adopted by the Master Builders of Iowa, Inc.

Refer to other bidding requirements described in Division 01 Section “Instructions to Bidders”.

Each bid shall be submitted on the Bid Form provided with the Bidding Documents and shall be accompanied by bid security as set forth in the Instructions to Bidders, in the amount of five (5) percent of the total bid.

Performance Bond Requirement: 100% of contract amount.

No bid may be withdrawn for a period of 30 calendar days after the date of opening.

The bidder to whom the Contract is awarded shall commence work no later than the date set forth in a Notice to Proceed to the Contractor from the Owner or its authorized representative.

The work of this Contract shall be completed on or before <CompletionDate>.

By virtue of statutory authority, a preference will be given to products and provisions grown and coal produced within the state of Iowa.

To the extent permitted by law, the Owner reserves the right to waive minor irregularities and to reject any and all bids.

This project is sales tax exempt. The Owner will issue an exemption certificate for the purchase or use of building materials, supplies, and equipment that will be used in the performance of the construction contract.

Owner:
Southeast Polk Community School District
8031 NE University Avenue, Pleasant Hill, IA 50327

Architect of Record:
RDG Planning & Design
301 Grand Avenue, Des Moines, Iowa 50309
Phone: (515) 288-3141

END OF SECTION 00 11 13

SECTION 00 21 13 – INSTRUCTIONS TO BIDDERS

1.1 SUMMARY

A. Definitions:
   1. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, are applicable to these Instructions to Bidders.
   2. Owner is defined as Southeast Polk Community School District.

1.2 SITE EXAMINATION

A. Examine the project site before submitting a bid.

B. Each Bidder by submitting a bid represents that they have visited the site to become acquainted with the scope of the work; conditions of site; facilities for delivery, storing, placing and handling of materials and equipment; other work being performed; other work in place; and other obstacles, conditions, or relevant matters concerning the work to be performed.

C. The successful Bidder will not be allowed extra compensation for any matter or thing which the bidder may have informed themselves of prior to submitting a bid

D. The Bidder is required to contact the Owner at the following address and phone number in order to arrange a date and time to visit the project site:
   1. Contact Name: Kevin Baccam, Chief Financial Officer.
   2. Email Address: kevin.baccam@southeastpolk.org.
   3. Phone Number: 515.957.4294.
   4. The currently occupied premises at the project site are open for examination by bidders only during the following hours:
      a. Monday through Friday: 8:00 AM to 4:00 PM.
      b. Weekends: Not available

1.3 PREBID CONFERENCE

A. DATE: September 17, 2025

B. TIME: 3 PM

C. LOCATION: Southeast Polk Community School District Board Room, 8031 NE University Avenue, Pleasant Hill, IA 50327

D. All general contract and major subcontract Bidders and suppliers are invited. Attendance by General Contractors is strongly recommended but not mandatory.

1.4 DOCUMENT EXAMINATION

A. Each Bidder by submitting a Bid represents that they have read and understands the Bidding Documents. This responsibility shall not be limited to paragraphs, sections, and drawings listed as pertaining to the trade or contract of a particular bidder. Bidder shall examine the document pertaining to the Work of other subcontracts and trades as their responsibility for certain work may be established therein.

B. Bidding Documents include the Advertisement to Bid, Instructions to Bidders, and the Contract Documents, including any Addenda issued prior to the receipt of bids.

C. Contract Documents are as defined in AIA Document A201 Article 1.

D. Addenda are written or graphic instruments issued prior to the execution of the Contract that modify or interpret the Bidding Documents, including Drawings or Specifications, by additions, deletions, clarifications or corrections. Addenda will become a part of the Contract Documents when the Construction Contract is executed.

1.5 INTERPRETATIONS

A. Should a bidder find discrepancies, ambiguities, or omissions in the documents; should they find work shown but not specified; or specified but not shown; or should they be in doubt as to any meaning, they shall immediately notify the Architect, in writing, at least 10 days before the closing of bids.

B. Failure to request clarifications will not relieve the Contractor of their responsibilities to perform the work in accord with the intent of the documents. The signing of the contract will be considered that the Contractor has a thorough comprehension of the full intent and scope of the specifications and drawings.

C. The Architect will issue any interpretation or correction as an Addendum. Only a written interpretation or correction by Addendum shall be binding. Bidder shall not rely upon any interpretation or correction given by any other method.

D. Prior to the receipt of bids, Addenda will be mailed or delivered to each person or firm recorded by the Architect as having received the Bidding Documents and will be available for inspection wherever the Bidding Documents are kept available for that purpose.

1.6 SUBCONTRACTORS

A. The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract:
   1. Must be acceptable to the Owner.
   2. Must comply with the requirements of the Bidding Requirements, Conditions of the Contract and the applicable Technical Specifications and Drawings.

B. Bidder shall identify sub-contractors indicated on the Bid Form.

C. Within the 48 hours following Bid Opening, the apparent low bidder shall submit a list of all subcontractors that will be used for this project. The subcontractor list shall include each firm's name, tax identification number, and address.

1.7 QUALIFICATION OF BIDDER

A. The Owner may make such investigations as they deem necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. All bidders shall complete the Bidder Status Form and include with bid submittal. If the successful bidder is a non-Iowa corporation, they shall submit proof to the Owner, prior to execution of the Contract, of authorization by the Secretary of State to do business in the State of Iowa. The Owner reserves the right to reject any bid if the evidence fails to satisfy the Owner that the bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

1.8 BID SECURITY

A. Bid Proposal shall be accompanied by a Bid Bond or a cashier's check drawn on a solvent Iowa bank or a bank chartered under the laws of the United States in the amount of 5% of the base bid. Bid security shall be made payable to the Owner. Submit bid security in a sealed envelope, separate from the envelope containing the bid proposal.

B. Form of Bid Bond shall be AIA Document A310-2010, Bid Bond. Bid Bond shall be executed by corporations authorized to contract as surety in the state of Iowa

C. The successful bidder, upon their failure or refusal to execute and deliver the contract and bonds required within 10 days after notice of the acceptance of the bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the bid security deposited with the bid proposal.

D. Bid security will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 30 days after the date of the opening of bids, upon demand by the bidder at any time thereafter, so long as they have not been notified of the acceptance of their bid.

1.9 SECURITY FOR FAITHFUL PERFORMANCE

A. Simultaneously with their delivery of the executed contract, the Contractor shall furnish a Surety Bond or Bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in Article 11 of the General Conditions and Supplementary General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

1.10 POWER OF ATTORNEY

A. Attorneys-in-fact who sign Contract Bonds must file with each Bond a certified and effectively dated copy of their Power of Attorney. Attorneys-in-fact must be residents of the state of Iowa for surety companies authorized to do business in the state of Iowa.

1.11 LAWS AND REGULATIONS

A. The bidder's attention is directed to the fact that all applicable State Laws, Municipal Ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

1.12 IOWA SALES TAX EXEMPTION

A. This project is Iowa sales tax exempt. The owner will issue an authorization letter and exemption certificate for the purchase or use of building materials, supplies, and equipment that will be used in the performance of the construction contract. Persons shall purchase such items of tangible personal property without liability for the tax if such property will be used in the performance of the construction contract and a purchasing agent authorization letter and an exemption certificate, issued by the designated exempt entity, are presented to the retailer. Said taxes shall not be included in the bid value for this project.

1.13 SUBSTITUTION OF MATERIALS AND PRODUCTS

A. Each bidder represents that their bid is based upon the materials and equipment described in the bidding documents.

B. No substitution will be considered unless written request has been submitted to the Architect for approval at least ten (10) days prior to the date for receipt of bids. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data, and any other data or information necessary for a complete evaluation. Refer to Document 00 26 00.

C. If the Architect approves a proposed substitution, such approval will be set forth in an Addendum.

1.14 AVAILABILITY OF SPECIFIED ITEMS

A. Verify prior to bidding that specified items will be available in time for installation during orderly and timely progress of the work.

B. In the event specified items will not be so available, notify the Architect prior to receipt of bids.

1.15 MODIFICATION AND WITHDRAWAL OF BIDS

A. Bidders may withdraw their bids at any time before bid closing. Bidders may modify such bids and resubmit them, or may submit new bids, so long as the requirements for submittal of bids are met.

B. No bid may be withdrawn during the bid holding period stated in the Bid Form.

1.16 PREPARATION OF BID

A. Bid Proposals shall be submitted on the prescribed form with all blank spaces for bid prices filled in, in ink or typewritten, in both words and figures. If in conflict, the amount written in words shall govern. If unit price and extension are in conflict, unit price shall govern. Additional information not requested or any alteration of the Bid Form may disqualify the Bidder.

B. Proposals shall indicate the full name of bidder, including the firm or corporate name of the bidder and shall longhand signature of a principal duly authorized to execute contracts for the bidder. Proposals signed by an agent of the bidder must be accompanied by evidence of the agent's authority to execute contracts for the bidder. The name of each person signing the proposal shall be typed or printed below the signature.

C. Submit Bid Form in opaque, sealed envelope, separate from bid security and Bidder Status Form, bearing on the outside the following:

BID FOR: Bus Maintenance Facility
Southeast Polk Community School District

BIDDER: [*Insert name of bidder*]

D. Submit bid security and Bidder Status Form in a separate envelope attached to the envelope containing the bid proposal.

E. If submitting by mail, enclose the above contents in another envelope and address it to the Southeast Polk Community School District at 8031 NE University Avenue, Pleasant Hill, IA 50327 . Indicate on front of envelope: “Sealed Bid Enclosed For: Bus Maintenance Facility, Southeast Polk Community School District”. The envelope shall bear the return address of the bidder.

F. Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

1.17 RECEIPT AND OPENING OF BIDS

A. Sealed bids for Bus Maintenance Facility, Southeast Polk Community School District will be received by the Owner at the Southeast Polk Community School District Board Room, 8031 NE University Avenue, Pleasant Hill, IA 50327 until 2 PM on September 30, 2025 and will be publicly opened and read aloud.

B. Bids will be received for a Single General Construction Contract – Stipulated Sum.

C. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

1.18 REJECTION OF BIDS

A. To the extent permitted by law, the Owner reserves the right to waive minor irregularities and to reject any and all bids. In addition, the Owner reserves the right to reject a bid if the bidder has failed to furnish any required bid security, or to submit data required by the bidding documents, or if the bid is in any way incomplete or irregular.

B. The Owner reserves the right to reject any bid if the qualifications of the bidder fail to satisfy the Owner that the bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

C. The Owner also reserves the right to negotiate modifications to Unit Prices for additions to, or deductions from, the scheduled amount of work as given in the bid if they are considered excessive or unreasonable.

1.19 AWARD OF CONTRACT

A. The Contract will be awarded on the basis of the apparent low base bid and the selection of any or all alternatives. Unit prices will not be considered in the determination of the award of Contract.

END OF SECTION 00 21 13

SECTION 00 26 00 – PROCUREMENT SUBSTITUTION PROCEDURES

1.1 SUMMARY

A. Pre-Bid Substitutions.

1.2 BIDDER'S OPTIONS

A. For products specified by reference standard only, select product meeting that standard, by any manufacturer.

B. For products specified by naming one or several products or manufacturers, select one of the products and manufacturers named. Submit a Request for Substitution for a product or manufacturer which is not specifically named unless "No Substitutions" is indicated. Architect and/or Engineer will review and consider for approval.

C. For products specified by naming one or several products or manufacturers and stating "or equivalent", or "equal", or "Architect approved equivalent", or similar wording, submit a Request for Substitution for a product or manufacturer which is not specifically named. Architect and/or Engineer will review and consider for approval.

D. For products specified by naming only one or several products or manufacturers, and "No Substitutions" is indicated, there is no option and no substitution will be allowed.

1.3 SUBSTITUTIONS

A. Prepare Base Bid in accordance with requirements of the Bidding Documents.
   1. Substitutions for products may be made during the bidding period by submitting a completed Request for Substitution form and providing substantiating product information. The Architect/Engineer will consider substitution requests for approval provided they meet the submittal requirements and product information is complete and accurate.
   2. Submit the Request for Substitution form via e-mail directly to the contact person listed on the Project Title Page of the discipline responsible for preparation of the related specification Section.
   3. Request for Substitution must be received by the Architect/Engineer a minimum of ten (10) calendar days prior to the Bid Date.
   4. Do not submit duplicate requests by multiple transmission methods such as mail delivery, hand delivery, fax, etc. Requests requiring physical samples may be delivered.
   5. Architect will notify Bidders of approved product substitutions in an addendum.

B. Submit a separate request for each item. Provide the following with each request:
   1. Complete data substantiating compliance of proposed substitution with requirements stated in Bidding Documents:
      a. Product identification, including manufacturer's name and address.
      b. Manufacturer's literature, identifying:
         1) Product description and model number.
         2) Reference standards.
         3) Performance and test data.
      c. Samples, as applicable.
      d. Name and address of projects on which product has been used and date of each installation.
   2. Itemized comparison of the proposed substitution with product specified, listing significant variations.
   3. Advise of any change in construction schedule resulting from use of proposed substitution.
   4. All effects of substitution on separate contracts.
   5. List of changes required in other work or products.

6. Designation of responsibility for cost of required license fees or royalties.
7. Description of availability of maintenance services and sources of replacement materials and parts.

C. Substitutions will not be considered for acceptance when:
1. Acceptance will require substantial revision of Contract Documents.
2. In the judgement of the Architect/Engineer, the submittal does not include adequate information for a comprehensive evaluation.

1.4 BIDDER'S REPRESENTATION

A. In making formal request for substitution the bidder represents that:
1. The bidder has investigated proposed product and has determined that it is equivalent to or superior in all respects to that specified.
2. The bidder will provide the same warranties or bonds for substitution as for the product specified.
3. The bidder will coordinate installation of the accepted substitution into the Work, and will make such changes as may be required for the Work to be completed in all respects.
4. The bidder waives claims for additional costs caused by substitution that may subsequently become apparent.

1.5 ARCHITECT'S ACTION

A. Review requests for substitution. Substitution requests that are either approved or not approved will not be returned to person submitting request.

B. Issue an addendum to identify accepted substitutions.

C. Only those substitutions noted as approved in an addendum may be included in the Bid.

1.6 SUBSTITUTION REQUEST FORM

A. A Request for Substitution form is included at the end of this Section.

B. Substitutions will be considered only when the Request for Substitution form is completed and submitted with product information requested.

C. If no samples are included with request, the preferred method of receipt is by email. Do not send duplicate request forms by mail.

D. If samples are included with request, include Request for Substitution form with delivery of samples. Do not mail or email duplicate request forms.

REQUEST FOR SUBSTITUTION **DATE RECEIVED:** _____

E-MAIL TO: CONTACT LISTED ON PROJECT MANUAL TITLE PAGE

PROJECT: **Bus Maintenance Facility**
Southeast Polk Community School District

PROJECT NO.: 3007.090.00

We submit the following product/system/material information for your consideration and approval:

SPECIFICATION SECTION NUMBER AND NAME: _____

SPECIFIED ITEM: _____

PROPOSED SUBSTITUTION: _____

Attach complete information on changes to Drawings and/or Specifications, which proposed substitution would require for its proper installation.

Submit with request necessary samples and substantiating data to show equivalency (quality and performance) to that specified. Clearly mark manufacturer's literature to identify proposed item and to identify criteria confirming product is equivalent to the specification.

Submit the Request for Substitution form via e-mail directly to the contact person listed on the Project Title Page of the discipline responsible for preparation of the related specification Section.

Do not submit duplicate requests by multiple transmission methods such as mail delivery, hand delivery, fax, etc. Requests requiring physical samples may be delivered.

The undersigned certifies that the function, appearance, quality, performance and compatibility with adjacent materials are equivalent to the specified item.

Submitted by:

(Signature) (Phone)

(Firm) (Fax)

(Address) (Email)

ARCHITECT ACTION:
□ RECOMMENDED □ NOT RECOMMENDED □ RECOMMENDED AS NOTED
□ RECEIVED LATE □ INSUFFICIENT DATA RECEIVED

By: Date:

ENGINEER OR CONSULTANT ACTION:
□ RECOMMENDED □ NOT RECOMMENDED □ RECOMMENDED AS NOTED
□ RECEIVED LATE □ INSUFFICIENT DATA RECEIVED

By: Date:

OWNER ACTION:
□ RECOMMENDED □ NOT RECOMMENDED □ RECOMMENDED AS NOTED
□ RECEIVED LATE □ INSUFFICIENT DATA RECEIVED

By: Date:

FILL IN ALL BLANKS BELOW:

A. Does the substitution affect dimensions indicated on the Drawings?

☐ Yes ☐ No If yes, describe the changes: _____

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

☐ Yes ☐ No If no, fully explain: _____

_____

C. What effect does substitution have on other Contracts or other trades?

_____

D. What effect does substitution have on construction schedule?

_____

E. Manufacturer's warranties of the proposed and specified items are:

☐ Same ☐ Different If different, fully explain: _____

_____

F. Reason for Request for Substitution:

_____

G. Comparison of specified item with the proposed substitution; list significant variations:

_____

H. What maintenance services are provided and who will provide:

_____

I. Estimated cost savings or additional cost to make substitution:

_____

(Attach additional sheets as required)

END OF SECTION 00 26 00

SECTION 00 30 00 – INFORMATION AVAILABLE TO BIDDERS

1.1 SUBSURFACE INVESTIGATION REPORT

A. A copy of a geotechnical report with respect to the building site is available for viewing at the office of the Owner, Architect, Landscape Architect, and Structural Engineer, titled as follows:

Geotechnical Exploration
SE Polk Transportation Building And Improvements
8445 NE University Avenue
Pleasant Hill, Iowa
PN 251201

Dated June 11, 2025 and prepared by Allender Butzke Engineering, Inc.

B. A copy of the geotechnical report noted above is also included bound at the back of the Project Manual.

C. This report identifies properties of below grade conditions and offers recommendations for the design of foundations prepared primarily for the use of the Architect/Engineer.

D. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

E. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to the Owner.

1.2 SITE SURVEY

A. A copy of the topographic survey with respect to the project site is available for viewing at the office of the Owner, Architect, Engineer and is included in the Construction Documents Sheet G01.02, titled as follows:

Site Survey dated 04/25/2025 and prepared by Nilles Associates, Ankeny, IA.

B. This survey identifies grade elevations prepared primarily for the use of the Architect/Engineer in establishing new grades and identifying natural water shed.

END OF SECTION 00 30 00

SECTION 00 41 13 – BID FORM

PROJECT: **Bus Maintenance Facility**
Southeast Polk Community School District

BID TO: **Southeast Polk Community School District**
8031 NE University Avenue, Pleasant Hill, IA 50327

BID FROM: .....

.....

.....

BID FOR: Contract work for the Bus Maintenance Facility Southeast Polk Community School District as shown in Bidding Documents dated September 3, 2025.

BID PLACE: Southeast Polk Community School District Board Room, 8031 NE University Avenue, Pleasant Hill, IA 50327

BID DATE: September 30, 2025

BID TIME: 2 PM

1. The undersigned BIDDER agrees, if the Bid is accepted, to enter into an agreement with OWNER, in the form included in the Bidding Documents, to perform and furnish the Work as specified or indicated in the Bidding Documents for the Bid Price and within the Bid Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
   A. This Bid will remain subject to acceptance for 30 days after the day of Bid opening;
   B. To the extent permitted by law, the Owner has the right to accept or reject this Bid, including alternate bids, and to waive minor informalities in the bidding;
   C. BIDDER accepts the provisions of the Instructions and Supplementary Instructions to Bidders regarding disposition of Bid Security;
   D. BIDDER will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within 10 days after the date of Owner's Notice of Award;
   E. BIDDER has examined copies of all the Bidding Documents;
   F. BIDDER has visited the site and become familiar with the general, local and site conditions;
   G. BIDDER is familiar with federal, state, and local laws and regulations;
   H. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents and additional examinations, investigations, explorations, tests, studies and data with the Bidding Documents;
   I. This Bid is genuine and not made in the interest of or on behalf of an undisclosed person, firm or corporation and is not submitted in conformity with an agreement or rules of a group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited another Bidder to submit a false or sham Bid; BIDDER has not solicited or induced a person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself an advantage over another BIDDER or over OWNER.
   J. **This project is sales tax exempt. The owner will issue an exemption certificate for the purchase or use of building materials, supplies, and equipment that will be used in the performance of the construction contract**.

3. BIDDER has received the following Addenda. Receipt of which is hereby acknowledged;

Addendum No.	Dated	Addendum No.	Dated
Addendum No.	Dated	Addendum No.	Dated
Addendum No.	Dated	Addendum No.	Dated

4. BIDDER hereby acknowledges that sales tax has not been included in the bid values listed below.

5. BIDDER will complete the work in accordance with the Contract Documents for the following price:

LUMP SUM BASE BID of $ _____

DOLLARS

(Fill in amount in both numbers and words.)

6. ALTERNATES: Include cost variation to above Base Bid amount applicable to the Work in accordance with Division 01 Section "Alternates".

ALTERNATE BID No. 1: *[Insert Description of Alternate Bid. Modify ADD / DEDUCT as required.]*

[ADD] Sum of $ _____

DOLLARS

(Fill in amount in both numbers and words.)

ALTERNATE BID No. 2: *[Insert Description of Alternate Bid. Modify ADD / DEDUCT as required.]*

[DEDUCT] Sum of $ _____

DOLLARS

(Fill in amount in both numbers and words.)

7. BIDDER agrees that all Work will be substantially complete on or before <CompletionDate> and ready for final payment in accordance with the General Conditions on or before **[Final Completion Date]**.

8. If awarded the contact, the Bidder intends to award subcontracts in the following areas to the firms listed below:

METAL BUILDING SYSTEM
MECHANICAL
PLUMBING
FIRE PROTECTION
ELECTRICAL

9. ATTACHMENTS: The following documents are attached to and made a condition of this Bid:

A. Bid Security of 5% of the bid amount in the form of a certified check or bid bond is enclosed. The bidder acknowledges the bid security becomes the property of the Owner in the event the contract and bonds are not executed within the time period set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

B. Bidder Status Form.

10. BID FORM SIGNATURE(S):

Signature	Title		
Printed Name	Company Name		
Date	Company Address		
Phone	City	State	Zip

END OF SECTION 00 41 13

Bidder Status Form

To be completed by all bidders — Part A

Please answer "Yes" or "No" for each of the following:

☐ Yes ☐ No My company is authorized to transact business in Iowa.
(To help you determine if your company is authorized, please review the worksheet on the next page).

☐ Yes ☐ No My company has an office to transact business in Iowa.

☐ Yes ☐ No My company's office in Iowa is suitable for more than receiving mail, telephone calls, and e-mail.

☐ Yes ☐ No My company has been conducting business in Iowa for at least 3 years prior to the first request for bids on this project.

☐ Yes ☐ No My company is not a subsidiary of another business entity or my company is a subsidiary of another business entity that would qualify as a resident bidder in Iowa.

If you answered "Yes" for each question above, your company qualifies as a resident bidder. Please complete Parts B and D of this form.

If you answered "No" to one or more questions above, your company is a nonresident bidder. Please complete Parts C and D of this form.

To be completed by resident bidders — Part B

My company has maintained offices in Iowa during the past 3 years at the following addresses:

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

City, State, Zip: _____

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

City, State, Zip: _____

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

You may attach additional sheet(s) if needed. City, State, Zip: _____

To be completed by non-resident bidders — Part C

1. Name of home state or foreign country reported to the Iowa Secretary of State:

_____

2. Does your company's home state or foreign country offer preferences to resident bidders, resident labor force preferences or any other type of preference to bidders or laborers? ☐ Yes ☐ No

3. If you answered "Yes" to question 2, identify each preference offered by your company's home state or foreign country and the appropriate legal citation.

_____

_____

You may attach additional sheet(s) if needed.

To be completed by all bidders — Part D

I certify that the statements made on this document are true and complete to the best of my knowledge and I know that my failure to provide accurate and truthful information may be a reason to reject my bid.

Firm Name: _____

Signature: _____ Date: _____

You must submit the completed form to the governmental body requesting bids per 875 Iowa Administrative Code Chapter 156. This form has been approved by the Iowa Labor Commissioner.

Worksheet: Authorization to Transact Business

This worksheet may be used to help complete Part A of the Resident Bidder Status form. If at least one of the following describes your business, you are authorized to transact business in Iowa.

☐ Yes ☐ No My business is currently registered as a contractor with the Iowa Division of Labor.

☐ Yes ☐ No My business is a sole proprietorship and I am an Iowa resident for Iowa income tax purposes.

☐ Yes ☐ No My business is a general partnership or joint venture. More than 50 percent of the general partners or joint venture parties are residents of Iowa for Iowa income tax purposes.

☐ Yes ☐ No My business is an active corporation with the Iowa Secretary of State and has paid all fees required by the Secretary of State, has filed its most recent biennial report, and has not filed articles of dissolution.

☐ Yes ☐ No My business is a corporation whose articles of incorporation are filed in a state other than Iowa, the corporation has received a certificate of authority from the Iowa secretary of state, has filed its most recent biennial report with the secretary of state, and has neither received a certificate of withdrawal from the secretary of state nor had its authority revoked.

☐ Yes ☐ No My business is a limited liability partnership which has filed a statement of qualification in this state and the statement has not been canceled.

☐ Yes ☐ No My business is a limited liability partnership which has filed a statement of qualification in a state other than Iowa, has filed a statement of foreign qualification in Iowa and a statement of cancellation has not been filed.

☐ Yes ☐ No My business is a limited partnership or limited liability limited partnership which has filed a certificate of limited partnership in this state, and has not filed a statement of termination.

☐ Yes ☐ No My business is a limited partnership or a limited liability limited partnership whose certificate of limited partnership is filed in a state other than Iowa, the limited partnership or limited liability limited partnership has received notification from the Iowa secretary of state that the application for certificate of authority has been approved and no notice of cancellation has been filed by the limited partnership or the limited liability limited partnership.

☐ Yes ☐ No My business is a limited liability company whose certificate of organization is filed in Iowa and has not filed a statement of termination.

☐ Yes ☐ No My business is a limited liability company whose certificate of organization is filed in a state other than Iowa, has received a certificate of authority to transact business in Iowa and the certificate has not been revoked or canceled.

SECTION 00 52 13 – AGREEMENT FORM

1.1 AGREEMENT

A. AIA Document A101-2017, Standard Form of Agreement Between Owner and Contractor, published by the American Institute of Architects, is hereby made a part of the Bidding Documents by reference.

END OF SECTION 00 52 13

SECTION 00 61 13 – BOND FORMS

1.1 PERFORMANCE AND PAYMENT BOND

A. AIA Documents A312, Performance and Payment Bond Form, 2010 Edition, published by the American Institute of Architects, is hereby made a part of the Bidding Documents by reference.

B. Properly executed copies of these bond forms will become part of the Contract Documents.

END OF SECTION 00 61 13

SECTION 00 72 13 – GENERAL CONDITIONS

1.1 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

A. AIA Document A201-2017, General Conditions of the Contract for Construction, is the General Conditions of the Contract. A copy of the General Conditions is included in the Project Manual.

B. Each article of the General Conditions remains in effect unless expressly amended or deleted by other contract documents.

END OF SECTION 00 72 13

AIA Document A201™– 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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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 theconfidentiality 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

(l) 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, a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or

substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all

rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

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

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

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

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

Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

SECTION 00 73 13 - SUPPLEMENTARY CONDITIONS

1. SUMMARY

A. Document Includes:
   1. Supplementary Conditions.

2. INTRODUCTION

A. The following supplements modify AIA Document A201-2017, General Conditions of the Contract for Construction. 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.

ARTICLE 1 GENERAL PROVISIONS
§ 1.1 Basic Definitions

Delete last sentence of Section 1.1.1 and add the following:

"The Contract Documents also include the bidding requirements (Notice to Bidders and Instructions to Bidders). Unless specifically enumerated in the Agreement, the Contract Documents do not include sample forms and the Contractor's Bid Form. The Contract Documents executed or identified in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers."

Add Section 1.1.2.1 as follows:

§ 1.1.2.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all of the Contract Documents, the Architect/Engineer shall identify such unsigned Documents. No Contract shall be formed between the parties until all Contract Documents are executed by both parties.

Modify the second sentence in Section 1.1.8 to read as follows:

"The Initial Decision Maker shall not be liable for results of interpretations or decisions rendered in good faith."

Add Section 1.1.9 to Section 1.1:

§ 1.1.9 Terms
The terms indicated below shall be defined as having the meanings assigned to them as follows:

.1 Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
.2 Furnish: To supply and deliver, unload, inspect for damage.
.3 Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, and make ready for use.
.4 Provide: To furnish and install.
.5 Substitute the word "Architect/Engineer" for "Architect" each time the latter word appears.

§ 1.2 Correlation and Intent of the Contract Documents
Add the following sentence to the end of Section 1.2.1:

“In the case of an inconsistency between Drawings and Specifications, or within either Document itself, not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation. In any case of discrepancy, the facts are to be brought to the attention of the Architect for a decision or interpretation.”

Add Section 1.2.4 to Section 1.2:

§ 1.2.4 Sections of Division 1 - General Requirements govern the execution of the Work of all sections of the specifications.

§ 1.4 Interpretation
Add Section 1.4.2 to Section 1.4

§ 1.4.2 In the event of conflicts or discrepancies among the Contract Documents not clarified by Addendum, interpretations will be based on the following priorities:

- **.1** Modifications to Contract.
- **.2** The Agreement.
- **.3** The Supplementary Conditions.
- **.4** The General Conditions of the Contract for Construction.

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

Delete Section 1.5.1 and substitute the following:

§ 1.5.1 Design Documents or other Instruments of Service are Owner’s exclusive property. Owner retains all common law, statutory and other reserved rights in the Design Documents or other Instruments of Service, including all copyrights in and to Design Documents and other Instruments of Service. Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim copyright in Design Documents or other Instruments of Service. Submittal or distribution to meet official regulatory requirements, or for other purposes in connection with Project are not to be construed as publication in derogation of Owner’s reserved rights.

§ 1.7 Digital Data Use and Transmission

Delete Section 1.7 text and add Sections 1.7.1 and 1.7.2:

§ 1.7.1 The Architect/Engineer may, with the concurrence of the Owner, furnish to the Contractor versions of Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.

ARTICLE 2 OWNER

Delete Section 2.1.2.

§ 2.2 Evidence of the Owner’s Financial Arrangements

Delete entire Section 2.2.

§ 2.3 Information and Services Required of the Owner

Modify Section 2.3.3 to read as follows:

“If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.”

Add the following at end of Section 2.3.4:

The Contractor shall compare information furnished by the Owner (including surveys and soils tests with observable physical conditions) and the Contract Documents, and on the basis of such review, shall report to the Owner and Architect/Engineer any conflicts, errors or omissions. Contractor shall be responsible for any additional costs, delays, and damages resulting from the Contractor's failure to immediately report any such errors, inconsistencies or omissions it discovers.

Delete Section 2.3.6 and substitute the following:

§ 2.3.6 The Owner will furnish the Contractor, free of charge, as many copies of Contract Documents as can be allocated for this use from quantities returned by Bidders. Contractor may purchase additional copies at the cost of reproduction, postage, and handling.

§ 2.5 Owner's Right to Carry Out the Work

Delete Section 2.5 text and substitute the following:

"If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within a seven (7) day period, or such shorter time period as may be reasonable under circumstances, after receipt of written notice from the Owner to the Contractor, to commence and continue correction of such default or neglect with diligence and promptness, the Owner may notify the Surety and request it to assume the obligations of the Contractor within seven (7) days following receipt by Contractor and Surety of written notice or the Owner may, without prejudice to any other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order or Construction Change Directive shall be issued deducting from the payments then or thereafter due the Contractor, the cost of correction of such deficiencies, including reasonable attorney's fees and compensation for the Architect/Engineer's additional services incurred as result of such default, neglect or failure. Such action by Owner, and amounts charged to the Contractor are both subject to prior concurrence with Architect/Engineer. If current or future payments thereafter due Contractor are not sufficient to cover such amounts, Contractor, or Surety, shall pay difference to Owner."

Add Section 2.6 as follows:

ARTICLE 3 CONTRACTOR
§ 3.1 General

Add the following at end of Section 3.1.1:

'Contractor shall at request of Owner prior to execution of Agreement and promptly from time to time as requested by the Owner, thereafter furnish Owner an update and current financial statement and/or Contractor Qualification Statement on AIA Document A305.'

Add Section 3.1.2.1 as follows:

§ 3.1.2.1 The Contractor shall supervise and direct Work in excellent and workmanlike manner, complete the work and everything properly incidental thereto as stated in the Project Manual and Drawings or reasonably implied therefrom and otherwise in accordance with Contract Documents. In no case shall the Contractor proceed with any portion of the Work in any uncertainty.

Add the following at the end of Section 3.1.3:

§ 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. To the extent permitted by law, the Contractor waives any rights, claims, or causes of action

against Owner as a result of activities or duties or intentional or negligent misconduct by the Architect in the Architect's administration of the Contract, or representations made by Architect/Engineer in Instruments of Service.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

Add the following at end of Section 3.2.1:

"The Contractor also represents that all Contract Documents for the Project have been examined; including those intended for work of trades not normally performed by Contractor's own forces, and that they have become thoroughly familiar with all conditions which may pertain to or affect Work under the Contract."

Modify Section 3.2.2 to add the words:

"including any ordering of materials' in line two after the word "Work."

Delete Sections 3.2.3 and 3.2.4 and substitute the following:

§ 3.2.3 Contractor shall take field measurements and verify Site conditions, and shall carefully compare such field measurements and Site conditions and other information know to Contractor with Contract Documents, before ordering any material or doing any Work at Site.

§ 3.2.4 Contractor shall make frequent inspections during progress of Work to confirm that Work previously performed by Contractor is in compliance with Contract Documents and applicable laws and regulations bearing on performance of Work and Referenced Standards and that portion of Work previously performed by Contractor or by others are in proper condition to receive subsequent Work

Add Sections 3.2.5 thru 3.2.8 to Section 3.2:

§ 3.2.5 If Contractor believes that any portion of Contract Documents do not comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, or any orders by code enforcement officials or Owner or its designees acting in capacity of building code inspectors or Referenced Standards, Contractor shall promptly notify Owner and Architect/Engineer of non-compliance as provided in Section 3.2.6 and request direction before proceeding with affected Work.

§ 3.2.6 Contractor shall promptly notify Owner and Architect/Engineer in writing of any apparent errors, inconsistencies, omission, ambiguities, construction impracticalities or code violations discovered as result of Contractor's review of Contract Documents including any differences between actual and indicated dimensions, locations and descriptions, and shall give Owner and Architect/ Engineer timely notice in writing of same and any corrections, clarifications, additional Drawings or Specifications, or other information required to define Work in greater detail or to permit proper progress of Work. Contractor shall provide similar notice with respect to any variance between its review of Site and physical data and Site conditions observed.

§ 3.2.7 If Contractor performs any Work involving an apparent error, inconsistency, ambiguity, construction impracticality, omission or code violation in Contact Documents of which Contractor is aware, or which could reasonably have been discovered by review required by Section 3.2, without promptly written notice to Owner and Architect/Engineer and request for correction, clarification or additional information, as appropriate, Contractor does so at its own risk and expense and all claims relating thereafter are specifically waived.

§ 3.2.8 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect/Engineer for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, or other

Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.3 Supervision and Construction Procedures

Modify Section 3.3.1 to add the word “written” between the words “timely” and “notice” in line 7.

Add Section 3.3.4 as follows:

§ 3.3.4 The Contractor acknowledges that it is Contractor’s responsibility to hire all personnel for the proper and diligent prosecution of the Work and the Contractor shall use its best efforts to maintain labor peace for the duration of the Project. In the event of a labor dispute, the Contractor shall not be entitled to any increase in the Contract Sum.

§ 3.4 Labor and Materials

Add the following at end of Section 3.4.1:

“Work required by the Contract Documents to be performed after working hours, or work the Contractor elects to perform after hours shall be completed at no additional cost to the Owner.”

Add Sections 3.4.2, 3.4.2.1, 3.4.2.2 and 3.4.2.3 to Section 3.4.2:

§ 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.

§ 3.4.2.1 After the Contract has been executed, the Architect, Owner, and Contractor shall function as a team to evaluate, review and consider substitution of products in place of those specified under the conditions set forth by the Architect.

§ 3.4.2.2 After the Contract has been executed, the Owner and Architect/ Engineer may consider requests for the substitution of products in place of those specified. The Owner and Architect/Engineer may, but are not obligated to, consider only those substitution requests that are in full compliance with the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

- **.1** represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- **.2** represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
- **.3** certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect/ Engineer’s redesign costs, and waives all claims for additional costs related to the substitution that subsequently become apparent; and
- **.4** Agrees that it shall, if the substitution is approved, coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects. [; and]

§ 3.4.2.3 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect/Engineer for reviewing the Contractor’s proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

Add the following to the end of Section 3.4.3:

Persons permitted to perform Work under Contractor or any Subcontractor or Sub-Subcontractor shall meet all employment eligibility, safety training, security or drug/alcohol testing requirements required by law or by Owner. Any person not complying with all such requirements shall be immediately removed from the site.

Add Section 3.4.3.1 to Section 3.4.3:

§ 3.4.3.1 The Contractor or its Subcontractors ("Company") shall not be owned, operated, or managed by a registered sex offender who has been convicted of a sex offense against a minor in accordance with Iowa Code 692A.113. In addition, the Contractor or their Subcontractors shall not permit an employee who is a registered sex offender convicted of a sex offense against a minor to be on real property of the schools of the Owner ("District") in accordance with Iowa Code 692A.113. The Contractor shall further acknowledge and certify by execution of the Contract that services provided under this Contract comply with Iowa Code 692A.113.

§ 3.5 Warranty

Delete Section 3.5.1 and add Sections 3.5.1 through 3.5.5:

3.5.1 Contractor shall warrant to Owner that materials and equipment furnished under Contract will be of good quality and new unless otherwise required or permitted by Contract Documents, that workmanship will be free from defects not inherent in quality required or permitted, that workmanship will comply with all applicable laws, building codes, rules and regulations, and that workmanship will conform to requirements of Contract Documents.

§ 3.5.2 Contractor's general warranty and any additional or special warranties shall not be limited by Contractor's obligations to specifically correct defective or nonconforming Work as provided in Article 12, nor shall they be limited by any other remedies provided in Contract Documents. Contractor shall also be liable for any damage to property or persons (including death) including consequential and direct damages relating to any breach of Contractor's general warranty or any additional or special warranties required by Contract Documents.

§ 3.5.3 Contractor shall furnish all special warranties required by Contract Documents to Owner no later than Substantial Completion. Owner may require additional special warranties in connection with approval of "Or-Equals" or Substitutions, Allowance items, Work that is defective or nonconforming, or acceptance of nonconforming Work pursuant to Article 12.

§ 3.5.4 In case of Work performed by Subcontractors and where warranties are required, secure warranties from said Subcontractors addressed to and in favor of Owner. Deliver copies of same to Architect/Engineer upon completion of Work. Delivery of said warranties shall not relieve Contractor from any obligations assumed under any other provision of Contract.

§ 3.5.5 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

Delete Section 3.6 text and add Sections 3.6.1 through 3.6.7 to Section 3.6:

§ 3.6.1 Iowa Use Taxes shall be paid on all supplies and materials used in, and made component parts of, the Project.

§ 3.6.2 Iowa Sales Taxes shall not be paid on qualified building materials purchased, or withdrawn from inventory, which will be incorporated into real property for the Project.

§ 3.6.3 The Owner is a designated exempt entity and will complete an online application to register this Contract with the Iowa Department of Revenue and Finance. The Owner will distribute Tax Exemption Certificates and Authorization Letters to the Contractor and all Subcontractors who have been identified at, or before filing of the Performance Bond. Refer to Iowa Department of Revenue and Finance publications available at http://www.state.ia.us/tax/business/Contr-ExEnt-Index.html.

§ 3.6.4 At or before the time the Performance Bond is filed, Contractor shall provide a listing to the Owner identifying all Subcontractors. Listing shall indicate company name, address, telephone number, fax number, contact name, and Employer ID # for Contractor and each Subcontractor. Contractor and Subcontractors shall make copies of the Tax Exemption Certificate and provide to each supplier providing construction material, a copy of the Tax Exemption Certificate. This Certificate will allow the Contractor and Subcontractors to purchase qualified building materials free from sales tax for the Project. The Tax Exemption Certificate and Authorization Letter have been developed exclusively for this purpose and are applicable only for the specific Project under this Contract.

§ 3.6.5 Contractor shall be responsible for informing themselves of tax laws, requirements, regulations, and interpretations as they apply to this Project.

§ 3.6.6 The Contractor and subcontractors shall be responsible for keeping records identifying the property purchased exempt from tax and verifying that the property purchased was used in the Contract with Owner. Contractor shall maintain all records, invoices, receipts, or other accounting data regarding material purchases and shall allow, upon written request of Owner, and within reasonable time frame after receipt of such request, Owner to audit such records to verify tax savings. If audit reveals taxes paid or savings not transferred to Owner, Contractor shall be liable to Owner for those amounts and Owner may back charge Contractor for those amounts if balance of funds due and payable remains at time of such discovery.

.1 Contractor shall require all Subcontractors of any tier to maintain all records, invoices, receipts, or other account data regarding material purchases. Contractor shall collect such records with each application for payment if receives from its Subcontractors and shall maintain such records in same manner and location as Contractor's records.

.2 Contractor shall ensure its Subcontractors and any lower-tier Subcontractors including these obligations in their contracts and bind themselves in same manner as Contractor is bound to Owner.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

Delete Section 3.7.1 and substitute the following:

§ 3.7.1 Unless otherwise specified in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections, including storm water permits, necessary for proper execution and completion of the Work which are legally required when bids are received or negotiations concluded. If applicable, Contractor shall file "Notice of Intent for NPDES Coverage Under General Permit", file and implement "Storm Water Pollution Prevention Plan (SWPPP)", maintain pollution prevention devices, and file "Notice of Discontinuation" upon stabilization of site for storm water run-off associated with Project. Refer to Iowa Department of Natural Resources publications regarding storm water management; available at http://www.iowadnr.com/water/stormwater/forms.html or call 515-281-7017 for filing requirements. Contractor shall also pay for governmental inspection fees associated with Storm Water Pollution Prevention Plan.

Delete Section 3.7.3 and substitute the following:

§ 3.7.3 If the Contractor, or any of its Subcontractors, 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.

Modify Section 3.7.4 as follows:

§ 3.7.4 Add the words ", in writing," in line 11 after the word "Contractor."

§ 3.7.4 Add the following before the last line: "Failure to properly register a claim within the twenty-one (21) day period shall be grounds for denial of the claim."

§ 3.7.5 If, in the course of the Work, the Contractor knowingly encounters and recognizes human remains, burial markers, archeological sites or previously un-delineated 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 or good faith belief of such existence of such remains or features may be made as provided in Article 15.

Add Sections 3.7.6 through 3.7.8 to Section 3.7:

§ 3.7.6 The Contractor shall be responsible for scheduling inspections related to performance of its Work, and shall ensure Work is complete and ready for inspections. Any costs associated with reinspection caused by irregularities, deficiencies or non-conforming Work will be borne by the responsible Contractor, including all architectural and engineering services related to evaluation of problems and development of any acceptable solutions.

§ 3.7.7 The Contractor shall take note and comply with all governing laws, rules, and regulations affecting the Work. This may include, but is not limited to, such laws, rules, and regulations as:

- **.1** Licensing of Contractors for special requirements, eg hazardous waste removal.
- **.2** Requirements for special construction permits.
- **.3** Exemption from sales tax, if applicable.
- **.4** Wage rates and employment requirements when required by law or by Owner.
- **.5** Local labor requirements.
- **.6** Non-discriminatory hiring practices.

§ 3.7.8 State of Iowa, its agencies, and its political subdivisions, including cities, school districts and public utilities are required by Iowa Code 73A.21 to require reciprocal resident bidder and resident labor force preference.

§ 3.7.8.1 "Resident Bidder" means person or entity authorized to transact business in State of Iowa and having place of business for transacting business with state at which it is conducting and has conducted business for at least three (3) years prior to date of first advertisement for public improvement. If another state or foreign country has more stringent definition of Resident Bidder, more stringent definition shall be applicable as to bidders from that state or foreign country.

§ 3.7.8.2 Resident Bidder shall be allowed preference against nonresident bidder from state or foreign country other than Iowa if that state or foreign country gives or requires any preference to bidders from that state or foreign country, including, but not limited to, any preference to bidders, the imposition of any type of force preference, or any other form of preferential treatment to bidders or laborers from state or foreign country. Preference allowed shall be equal to preference given or required by state of foreign country in which nonresident bidder is resident.

§ 3.7.8.3 If Contractor is nonresident bidder Contractor is required to specify in Agreement between Owner and Contractor, whether ay preference is in effect in nonresident bidder's state or country at time of this bid and identify source of regulations.

§ 3.9 Superintendent

Add the following to the end of the first sentence of Section 3.9.1:

", including Work of the Contractor's subcontractors".

Add the following to the end of Section 3.9.1:

"The approved superintendent will work in this position until completion of the Work unless the superintendent shall no longer be in the Contractor's employ or shall be released at the request of the Architect and/or Owner."

Delete Subparagraph 3.9.2 and substitute the following:

§ 3.9.2 The Contractor shall, within three (3) business days of the Owner's notification of an intent to award the Contract, submit to the Owner, and Architect/Engineer, the name and qualifications of the proposed superintendent(s) for review and approval. Within fourteen (14) days of receipt of the information, the Architect shall notify the Contractor whether the Owner or Architect has reasonable objection to the proposed superintendent. When the superintendent(s) are approved, they shall not be removed without the Owner's written approval which will not be unreasonable withheld. The responsibility of the superintendent is to supervise, schedule, coordinate, and manage field operations.

Add Subparagraph 3.9.3.1 as follows:

§ 3.9.3.1 The Superintendent or Superintendents shall be thoroughly competent with full experience in all phases of the Work to be performed under this Contract. Anyone not deemed capable of directing all trades involved in the Work shall be replaced or supplemented immediately upon request, by someone who is satisfactory. After a satisfactory superintendent has been assigned, they shall not be withdrawn without the consent of the Architect and/or Owner.

§ 3.10 Contractor's Construction and Submittal Schedules

Delete Sections 3.10.1 and 3.10.2 and substitute the following:

§ 3.10.1 The Contractor, within fourteen (14) days of award of Contract, shall prepare and submit in its native electronic and graphic format, Owner's and Architect/ Engineer's approval Contractor's baseline construction schedule for Work. Schedule shall not exceed time limits current under Contract Documents, shall be revised at appropriate intervals as required by conditions of Work and Project, shall be related to entire Project to extent required by Contract Documents, or as requested by Owner or Architect/Engineer, and shall provide for expeditious and practicable execution of Work.

Schedule at minimum shall demonstrate rate of work (ROW), availability dates, permits, submittals, working drawings, procurement, fabrication, delivery of materials, construction, and other activities necessary to complete Work.

Thereafter, Contractor shall prepared and update construction schedule on at least a monthly basis ("Current Construction Schedule"), if not more frequently at Owner's or Architect's request, to be submitted to Owner in graphic and native electronic format with each Application for Payment. Each update shall include narrative including:

- **.1** Description of status of schedule.
- **.2** Discussion of current and anticipated delays.
- **.3** Discussion of progress of critical path activities.
- **.4** Discussion of critical path for remainder of project.
- **.5** Listing and discussion of logic changes and duration changes.

§ 3.10.2 Contractor shall prepare submittal schedule within fourteen (14) days after being awarded Contract and thereafter as necessary to maintain current submittal schedule and shall submit schedule(s)

for Architect/Engineer's approval. Architect/Engineer's approval shall not unreasonably be delayed or withheld. Submittal schedule shall:

.1 be coordinated with Contractor's construction schedule, and;

.2 allow Architect/Engineer 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.

Add Section 3.10.4 as follows:

§ 3.10.4 The Contractor shall furnish information concerning the Work. This information will include, but not be limited to the following:

Daily: Manpower by craft.

Weekly: Two week look ahead schedule update. Delivery requirements and status of materials.

Monthly: Written report including schedule update as outlined above and cost information.

§ 3.11 Documents and Samples of Site

Delete Section 3.11 text and substitute the following:

Contractor shall maintain at site for Owner one copy of Drawings, Specifications, Addenda, Current Construction Schedule, Change Orders and other Modifications, in good order and marked currently to indicate field and similar required submittals. Contractor shall display current Construction Schedule at site for reference and reliance by Owner and Architect/Engineer. These shall be available to Architect/Engineer and shall be delivered to Architect/Engineer for submittal to Owner upon completion of Work as record of Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

Add the following at end of Section 3.12.5:

"Contractor shall provide Owner and Architect/Engineer with copies of all submittals made to regulatory agencies."

Add the following at end of Section 3.12.7:

"Contractor shall correct at their cost, and without any adjustment in Contract time, any Work the correction of which is required due to Contractor's failure to obtain approval of submittal required to have been obtained prior to proceeding with Work, including, but not limited to, correction of any conflicts in Work resulting from such failure."

Modify Section 3.12.10.1 by adding the word "reasonably" before the word "rely" in line 4.

Add Section 3.12.11 to Section 3.12:

§ 3.12.11 The Architect/Engineer's and Consultant's review of Contractor's submittals will be limited to examination of an initial submittal and 1 resubmittal. Architect will notify the Contractor before beginning a further review that such review will result in additional cost to the Owner which can be charged back to Contractor. The Contractor shall reimburse the Owner for amounts paid to the Architect/Engineer for evaluation of additional resubmittals.

§ 3.13 Use of Site

Add Sections 3.13.1, 3.13.2, and 3.13.3 to Section 3.13:

§ 3.13.1 Except as may be specifically provided in Contract Documents, Contractor shall provide all necessary temporary facilities, including power, water, sanitation, scaffolding, storage, and security. If Owner makes any such facilities available to Contractor, it is without representation or warranty as to their adequacy for Contractor's use, and Contractor shall indemnify, defend, and hold Owner harmless from and against any claims arising out of Contractor's use of such facilities.

§ 3.13.2 Contractor shall perform Work so as to cause minimum of inconvenience to and interruption of Owner's operations Any and all interruptions of operations of Owner necessary for performance of Work shall be noted in progress schedule and Contractor shall additionally give Owner sufficient advance notice of such interruption as to allow Owner to adjust operations accordingly. Contractor's failure to give Owner timely notice of such intentions shall place responsibility of any resulting delays or additional costs solely on Contractor.

§ 3.13.3 Contractor shall not bring or permit any subcontractor, supplier or anyone else for whom Contractor is responsible, to bring on site any asbestos, PCB's, petroleum, hazardous waste, or radioactive materials (except for proper use in performing Work).

§ 3.15 Cleaning Up

Delete Section 3.15 title above and substitute the following:

§ 3.15 Cleaning Up, Working Hours, and Noise Ordinance

§ 3.15.1 Work shall be performed in accordance with Contract Documents, Applicable Building Codes, and other applicable law governing Contractor's performance of Work. No delays resulting from compliance with applicable laws or regulations may form basis for any claim by Contractor for delay damages or additional compensation or for any extensions of Contract Time. Contractor shall not permit work outside of hours established in Contract Documents on Saturday, Sunday or State or federal holiday without written consent of Owner, given after prior written notice to Architect/Engineer and any other applicable consultants; such consent, if given, may be conditioned upon payment by Contractor of Owner's, Architect/Engineer's and any other applicable consultants' additional costs and fees, testing or regulatory agency costs incurred in monitoring such off-hours Work. Contractor shall notify Owner as soon as possible if Work must be performed outside of such times in interest of safety and protection of persons or property at Site or adjacent thereto, or in event of emergency. In no event shall Contractor permit Work to be performed at Site without presence of Contractor's superintendent and person responsible for protection of persons and property at Site and compliance with all applicable laws and regulations, if different from superintendent.

§ 3.15.2 Contractor shall comply with any applicable Noise Ordinances and any successor or substitute provisions covering regulation of noise levels. It shall be the duty of Contractor to familiarize themselves with those provisions and perform Work in compliance with those provisions.

Add Section 3.15.3 to Section 3.15:

§ 3.15.3 Contractor shall keep Site and adjacent areas free from accumulation of waste materials or rubbish caused by operations under Contract, and shall keep tools, construction equipment, machinery and surplus materials suitably stored when not in use. If Contractor fails to do so in manner reasonably satisfactory to Owner or Architect/Engineer within forty-eight (48) hours after notice or as otherwise required by Contract Documents, Owner may clean Site and back charge Contractor for all costs associated with cleaning. Contractor shall keep premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under Contract. At completion of Work, Contractor shall remove waste materials, rubbish, Contractor's tools, construction equipment, machinery and surplus materials from and about Project.

§ 3.17 Royalties, Patents and Copyrights

Insert the words “reasonably suspected or” in line six of Section 3.17 after the word “is” and before the word “discovered.”

§ 3.18 Indemnification

Delete Section 3.18.1 and substitute the following:

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless Owner, Architect, Architect’s consultants, their agents, representatives, and employees (“Indemnitees”) from and against all claims, damages, losses and expenses, including, but not limited to, attorney’s fees, arising out of or resulting from or in connection with performance of the Work, 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 otherwise reduce any other right or obligation of indemnity or contribution which would otherwise exist, as to any party or person described in Contract Documents.

ARTICLE 4 ARCHITECT

§ 4.1 General

Delete Section 4.1.1 and substitute the following:

The “Architect” is defined in this Contract as the Engineer or Architect lawfully licensed by the State to practice architecture or engineering or an entity, licensed by the State to lawfully practice architecture or engineering identified as such in this Contract and as is referred to throughout the Contract documents as if singular in number. The term “Engineer,” “Architect/Engineer,” “Engineer/Architect,” “Architect’s authorized representative,” “Engineer’s authorized representative,” or “Architect/Engineer’s authorized representative” shall mean “Architect” as defined in this paragraph.

§ 4.2 Administration of the Contract

Delete Section 4.2.2 and substitute the following:

§ 4.2.2
The Architect, as a representative of the Owner, shall attend all official construction meetings and visit the site while Work is in progress not less than monthly, or as required or otherwise mutually agreed to by the parties in the Owner/Architect agreement, to observe and evaluate the site and the Work; to become familiar with the progress and quality of the Work; and to determine whether the Work evaluated and observed is proceeding in accordance with the Contract Documents and construction schedule and whether there are defects or deficiencies in the Work evaluated and observed. 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.

Add Section 4.2.2.1 to Section 4.2.1:

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect/Engineer for site visits made necessary by the fault of the Contractor or by defects and deficiencies of the Work.

Delete Section 4.2.3 and substitute the following:

§ 4.2.3 On the basis of on-site observations and evaluations, the Architect shall keep the Owner reasonably informed of the progress and quality of the Work and its conformance with the Contract Documents and the construction schedule. The Architect will provide the Owner with a field observation report within five (5) working days of each visit and construction update minutes as the Project progresses. The Architect shall report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor and (2) defects and deficiencies observed in the Work. 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, except as provided in Section 3.3.1.

Delete Section 4.2.4 and substitute the following:

§ 4.2.4 Communications
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall include the Architect in 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 relevant 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.

Section 4.2.4; Add the following subparagraphs:
"4.2.4.1 All notices, demands, requests, instructions, approvals, proposals and claims must be in writing. Any notice or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the agreement (or at such other office as the contractor may from time to time designate in writing to the Owner), or if deposited in the United States mail in a sealed, postage-paid envelope or delivered with charges prepaid to any telegraph company for transportation, in each case addressed to such office."

"4.2.4.2 All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the office of the Architect at RDG Planning and Design, 301 Grand Avenue, Des Moines, IA 50309 and any notice to or demand upon the Owner shall be sufficiently given if so delivered, or if deposited in the United States mail in a sealed, postage prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission to said Owner at such address, or to such other representatives of the Owner may subsequently specify in writing to the Contractor for such purpose."

"4.2.4.3 Any such notice shall be deemed to have been given as of the time of actual delivery of (in the case of mailing) when the same should have been received in due course of post, or in the case of telegrams, at the time of actual receipt, as the case may be."

Add Section 4.2.7.1 to Section 4.2.7:

§ 4.2.7.1 In no case will the Architect/Engineer's review period on any submittal be less than fifteen (15) days after receipt of the submittal from the Contractor.

Modify Section 4.2.12 to delete the words "will not show partiality to either."

Add Section 4.2.14.1 to Section 4.2.14:

§ 4.2.14.1 Contractor's requests for information shall be prepared and submitted in accordance with Division1 "General Requirements" sections on form acceptable to Architect/Engineer. The

Architect/Engineer will return without action requests for information that does not conform to requirements of the Contract Documents. In no case will Architect/Engineer's review period on any submittal be more than fifteen (15) days after receipt of the submittal from the Contractor.

ARTICLE 5 SUBCONTRACTORS

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

In the 2nd line of Section 5.2.1, after the word "Contractor", delete the phrase "as soon as practicable after award of the Contract", and insert the phrase "within ten (10) days after the date of the notice of award of the Contract".

Add the following to the end of Section 5.2.1:

"A list of Subcontractors shall be submitted in duplicate on AIA Document G805, 2001 Edition. Contractor shall update this list throughout Project and keep Owner and Architect/Engineer advised of any new subcontractors employed."

Add Section 5.2.5 to Section 5.2:

§ 5.2.5 Manufacturers and Fabricators

§ 5.2.5.1 Not later than thirty (30) days after the date of commencement of the Work, the Contractor shall furnish in writing to the Owner through the Architect/ Engineer the names of persons or entities proposed as manufacturers or fabricators for certain products, equipment and systems identified in the General Requirements (Division 1 of the Specifications) and, where applicable the name of the installing Subcontractor. The Architect/Engineer may reply within fourteen (14) days to the Contractor in writing stating:

.1 whether the Owner or the Architect/Engineer has reasonable objection to any such proposed person or entity, or

.2 that the Architect/Engineer requires additional time to review.

Failure of the Owner or Architect/Engineer to reply within the fourteen (14) day period shall constitute notice of no reasonable objection.

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

§ 5.2.5.3 If the Owner or Architect/Engineer has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect/Engineer has no reasonable objection. If the proposed but rejected manufacturer or fabricator was reasonable 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 manufacturer's or fabricator'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.

§ 5.2.5.4 The Contractor shall not substitute a person or entity previously selected if the Owner or Architect/Engineer makes reasonable objection to such substitution.

§ 5.4 Contingent Assignment of Subcontracts

Delete Section 5.4.2 in its entirety.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

Add the following to the end of Section 6.1.1

The Contractor shall give notification of the potential of a claim in writing to the Owner and/or Separate Contractor within forty-eight (48) hours of the occurrence or discovery of the potential of an occurrence of the delay or action that will result in making a claim.

§ 6.2.2 Delete the last sentence of Section 6.2.2 and insert the following to the end of section:

", except as to defects not then reasonably discoverable."

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

Add the following at end of Section 7.1.1:

"No claim for an addition to the maximum Contract sum shall be considered a valid claim unless a written change order procedure is followed as outlined in this Section. Verbal authorization for changes must be supported by written approval before being considered valid."

Add Section 7.1.4 to Section 7.1:

§ 7.1.4 The combined overhead and profit included in the total cost to the Owner for a change in the Work, whether by Change Order or Construction Change Directive shall be based on the following schedule, except that the percentages may be adjusted to reflect differences for different trade practices if satisfactorily substantiated to Architect:

- **.1** Ten percent (10%) if Work is performed by the Contractor, five percent (5%) if Work is performed by Subcontractor or Sub-subcontractor.
- **.2** Five percent (5%) if Work is performed by Subcontractor or Sub-subcontractor. Subcontractor and Sub-subcontractor's total aggregate shall not exceed ten percent (10%) percent of the cost.
- **.3** Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.
- **.4** On Work deleted from the Contract, credit to the Owner shall be the Architect/Engineer approved net cost plus one-half (½) of the overhead and profit percentage noted above.
- **.5** 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 described above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over $500.00 be approved without such itemization.

§ 7.2 Change Orders

Add Section 7.2.2 to Section 7.2:

§ 7.2.2 Contractor shall submit change proposals covering contemplated Change Order within ten (10) days after request of Owner, or Architect/Engineer or within ten (10) days after event giving rise to Contractor's claim for change in Contract Sum or Contract Time. No increase in Contract Sum or extension of Contract Time will be allowed Contractor for cost or time involved in making change proposals. Change proposals shall define or confirm in detail Work which is proposed to be added, deleted, or changes and shall include any adjustment which Contractor believes to be necessary in (i) Contract Sum, (ii) Contract time. Any proposed adjustment shall include detailed documentation

including, but not limited to; cost, properly itemized and supported by sufficient substantiating data to permit evaluation including cost of labor, materials, supplies and equipment, rental cost of machinery and equipment, additional bond cost, plus fixed fee for profit and overhead (which includes office overhead and site-specific overhead and general conditions) of ten percent (10%) if Work is performed by Contractor, or five percent (5%) if Work is performed by Subcontractor or Sub-subcontractor. Subcontractors and Sub-subcontractors overhead and profit in turn shall not exceed total aggregate of ten percent (10%).

Change proposals shall be binding upon Contractor and may be accepted or rejected by Owner at their discretion. Owner may, at their option, instruct Contractor to proceed with Work involved in change proposal in accordance with this section without accepting change proposal in its entirety.

Add Sections 7.2.3 and 7.2.4 to Section 7.2 as follows:

§ 7.2.3 If the Owner determines that a change proposal is appropriate, the Architect will prepare and submit a request for a Change Order or Contract Amendment providing for an appropriate adjustment in the Contract Sum or Contract Time, or both, for further action by the Owner. No such change is effective until the Owner and Architect sign the Change Order.

§ 7.2.4 The forms used to process a Change Order will include AIA Document, G701 Change Order.

§ 7.3 Construction Change Directives

Add the following at end of Section 7.3.2:

"; upon prior written approval from Owner".

Add the words "Owner and the" in line two of Section 7.3.4 after the word "the" and before the word "Architect."

ARTICLE 8 TIME
§ 8.1 Definitions

Add the following at end of Section 8.1.2:

"or the date of the Notice to Proceed, whichever occurs later".

§ 8.2 Progress and Completion

Add the following at end of 1st sentence of Section 8.2.2:

", or prior to approval of Certificates of Insurance, and Additional Insured Endorsement and Notice of Cancellation Endorsement required to be submitted to Owner under Contract".

Add the following at end of Section 8.2.3:

"If Contractor's Work shall fall behind schedule for reasons that are not excused under terms of Contract, Contractor shall add additional workers or shifts, and/or work overtime as necessary to maintain Construction Schedule".

Add Section 8.2.4 through 8.2.8 to Section 8.2'.

§ 8.2.4 Contractor shall conform to most recent approved Construction Schedule. Contractor shall complete indicated Work or achieve required percentage of completion, as applicable, within any interim completion dates established in most recently approved Construction Schedule.

§ 8.2.5 Contractor shall maintain at Site, available to Owner and Architect/ Engineer for their reference during progress of Work, a copy of approved Construction Schedule and any approved revisions thereto. Contractor shall keep current records of, and mark on copy of approved Construction Schedule actual commence date, progress, and completion date of each scheduled activity, indicated on Construction Schedule.

§ 8.2.6 Contractor represents that their Bid includes all costs, overhead and profit which may be incurred throughout Contract Time and period between Substantial and Final Completion. Accordingly, Contractor shall not make any claim for delay damages based in whole or in part on premise that Contractor would have completed Work prior to expiration of Contract time but for any claimed delay.

§ 8.2.7 If Contractor's progress is not maintained in accordance with approved Construction Schedule, or the Owner determines that Contractor is not diligently proceeding with Work or has evidence reasonably indicating that Contractor will not be able to conform to most recently approved Construction Schedule, Contractor shall, promptly and at no additional cost to Owner, take all measures necessary to accelerate its progress to overcome delay and ensure that there will be no further delay in progress of Work and notify Owner.

§ 8.2.8 Owner reserves right to issue written directive to accelerate Work that may be subject to an appropriate adjustment, if any, in Contract Sum. If Owner requires an acceleration of Construction Schedule and no adjustments are made in Contract Sum, or if Contractor disagrees with any adjustment made, Contractor shall file claim a provided in Article 15 or same will be deemed to be conclusively waived.

§ 8.3 Delays and Extensions of Time

Delete the words "labor dispute" and add the words "excusable weather delays as defined in Section 15.1.5.2," between the words "fire" and "unusual" in 3rd line of section 8.3.1.

Add the following at end of Section 8.3.1:

"A time extension shall be Contractor's only remedy and compensation for all such delays other than those resulting from the acts of negligence of the Owner, the Architect/Engineer, or the Owner's separate contractors (collectively "Owner Caused Delays"). For proven Owner Caused Delays, the Contractor may recoup the actual costs resulting from such delays, but not for any additional profit or fee."

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.2 Schedule of Values

In the 1st sentence, add the words "thirty (30) days" between the words "Architect," and "before".

§ 9.3 Applications for Payment

Delete Section 9.3.1 and substitute the following:

§ 9.3.1 At least thirty (30) days before the date established for each progress payment, Contractor shall submit to Architect/Engineer an itemized Application for Payment for operations completed in accordance with Schedule of Values. Such application shall be notarized, supported by such data substantiating Contractor's right to payment as Owner or Architect/Engineer may require, such as copies of requisitions and release of claims from Subcontractors and suppliers. Applications for Payment shall clearly reflect retainage of five percent (5%) of the total amount due to the Contractor which shall be retained by the Owner.

Once Application is approved by Architect/Engineer, Application for Payment will be submitted to Owner for its approval at its next regularly scheduled meeting. The Application must be received at the Owner's

office in accordance with Owner's outlined procedures as applicable. Unless notified otherwise, the Application shall be received by Owner at least one week prior to scheduled meeting for it to be included in that meetings scheduled business.

The form of Application for Payment, duly notarized, shall be current authorized edition of AIA Document G702-1992, Application and Certification for Payment, supported by a current authorized edition of AIA Document G703-1992, Continuation Sheet.

Modify Section 9.3.1.2 by inserting the following the word "Payments" in line 1: "must be consistent with the approved Schedule of Values and".

Add Sections 9.3.1.3 through 9.3.1.5 to Section 9.3.1:

§ 9.3.1.3 Until Substantial Completion the Owner shall pay ninety-five percent (95%) of the amount due the Contractor on account of progress payments.

§ 9.3.1.4 The Owner's release of retained funds and final payment to the Contractor shall be made in accordance with Iowa Code Chapters 26 and 573 provisions.

§ 9.3.1.5 Progress Payments shall be made monthly upon application. Monthly estimates will be paid to the Contractor as the Work progresses in amounts equal to ninety-five percent (95%) of the Contract value of the Work completed during preceding calendar month, including actual cost of materials and equipment of permanent nature to be incorporated in the Work, and delivered to and stored at the job site. Such monthly payments shall in no way be construed as an act of acceptance for any part of the Work, partially or totally completed. The Contractor shall submit a final application for payment of retainage at conclusion of Project. Final payment of five percent (5%) due the Contractor will be paid not earlier than thirty-one (31) days from date of final acceptance of Work by Owner, and after receipt of satisfactory evidence that all claims pertaining to such Contract have been paid in full as approved in Contract Documents for said Work.

§ 9.5 Decisions to Withhold Certification

Add following at end of Section 9.5.1:

.8 Service work not attended to;
.9 Evidence of lack of careful workmanship;
.10 Unworkmanlike or over expeditious construction;
.11 Lack of attention to special field duties specified.

Delete Section 9.5.4 in its entirety and replace with the following:

§ 9.5.4 The Contractor shall make accessible and available to the Architect all labor, material, and equipment accounts related to the work in question, insofar as they may in any way affect a disputed amount due the Contractor from the Owner.

§ 9.6 Progress Payment

Add the words "following Board approval" between the words "payment" and "in" in 1st line of Section 9.6.1.

Add Section 9.6.1.1 to 9.6.1 as follows:

§ 9.6.1.1 Owner will, within thirty (30) days of presentation to them of Notarized Certificate for Payment, pay Contractor progress payment on basis of approved Application for Payment. Laws of State of Iowa shall be followed regarding Contractor Payment, with a five percent (5%) retainage held from each progress payment. Final payment shall be made no sooner than thirty-one (31) days following final approval and acceptance of completed Project.

Delete Paragraph 9.6.4 and substitute the following:

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven (7) days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Regardless of any requests made pursuant to this section, neither the Owner nor Architect/Engineer shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.8 Modify Section 9.6.8 by deleting the word "lien" throughout and replacing it with the words "Iowa Code Chapter 573."

Add Section 9.6.8.1 to Section 9.6 as follows:

§ 9.6.8.1 Payment to Contractor will be made by Owner from cash on hand from such sources as may be legally available.

§ 9.7 Failure of Payment

Delete last sentence of Section 9.7 and revise Paragraph 9.7 as follows:

In the first line, change "…seven days…" to "…fifteen (15) days…".
In the second line, change "…seven days…" to "…fifteen (15) days…".

§ 9.8 Substantial Completion

Add the following at end of Section 9.8.1:

", subject only to completion of minor punch list items, the absence of completion of which does not interfere with Owner's intended use of Project. The Contractor assumes the responsibility for notifying the Architect in writing when the Project is complete and ready for inspection and review by Architect. This letter to the Architect shall include the date after which the Contractor will be ready for final review and inspection. Designated portions of the Work will be reviewed separately."

Add Section 9.8.3.1 to Section 9.8.3:

9.8.3.1 The Architect/Engineer will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect/Engineer for any additional inspections.

Add Sections 9.8.6 through 9.8.9 to Section 9.8:

§ 9.8.6 The Certificate of Substantial Completion and accompanying punch list must be submitted to the Owner and Contractor for execution, which, when signed, will constitute their written acceptance of responsibilities assigned to them in such Certificate. Contractor must make all corrections on the punch list prior to notifying Architect of its completion as outlined in Section 9.10. The Contractor shall reimburse Owner for any Architect/Engineer's Additional Services and/or attorney's fees incurred as result of Contractor's failure to finally complete Work within sixty (60) days after date specified in Contract Documents for Project Substantial Completion, or subsequently modified by Change Order or dates established in the Certificate of Substantial Completion. Reimbursement for these additional services will be deducted by the Owner from the amounts due the Contractor and paid directly to the Architect/Engineer. For purposes of this Paragraph "incurred as result of" includes any Architectural fees charged to Owner as Additional Fees under contract due to fact that services were performed sixty (60)

days (or some other amount of time specified in Architect/Engineer Agreement) after Substantial Completion. Nature of services performed (and whether they would have otherwise been performed as normal closeout services at some point under Basic Services) is not relevant to Contractor's obligations for reimbursement under this section if contract between Owner and Architect/Engineer states that any services and related fees are defined as Additional Services solely because they were performed more than sixty (60) days (or some other amount of time specified in Owner/Architect/Engineer Agreement) after Substantial Completion.

§ 9.8.7 Upon achieving Substantial Completion, as defined by Iowa Code law, the Contractor may request release of all or part of retained funds being held on the Project. Remaining retained funds shall not become due until the Contractor submits to the Architect/Engineer:

.1 Sworn statement that ten (10) calendar days prior to filing request for release of retained funds, a notice was given to all known subcontractors, sub-subcontractors, and suppliers that Contractor was requesting release of retained funds. The notice shall be substantially similar to the following:

"Notice of Contractor's Request for Early Release of Retained Funds"

"You are hereby notified that [name of contractor] will be requesting an early release of funds on a public improvement Project designated as [name of project] for which you have or may have provided labor or materials. The request will be made pursuant to Iowa Code section 26.13. The request may be filed with the [name of public entity] after ten (10) calendar days from the date of this notice. The purpose of the request is to have [name of public entity] release and pay funds for all work that has been performed and charged to [name of public entity] as of the date of this notice. This notice is provided in accordance with Iowa Code section 26.13."

.2 Itemized list of Work left to complete, including estimated value of labor and materials.

.3 Itemized list of Iowa Code Chapter 573 claims currently on file at time request for release of retained funds is received.

.4 Written confirmations from governmental agencies that all permit and inspection fees, including SWPPP inspections fees have been paid by Contractor.

.5 Operation, Maintenance, and Warranty Manuals and Record Drawings and Specifications.

§ 9.8.8 If proper documentation requested in Subparagraph 9.8.7 is received from Contractor, Owner shall make payment due Contractor at Owner's next monthly board meeting or within thirty (30) days, whichever is less, except the Owner may retain the following to the extent authorized by law:

.1 An amount equal to two hundred percent (200%) of the value of labor and materials yet to be provided on the Project as determined by the Owner and its authorized contract representative. For purposes of this Section, "authorized contract representative" means the Architect. Final values to be withheld shall be determined by the Architect/Engineer based on initial estimates provided by Contractor and Architect/Engineer's on-site visits and observations.

.2 Double the amount of any Iowa Code Chapter 573 claims currently on file.

.3 An amount equal to one-half percent (½) of the total value of the Project for Operation, Maintenance, and Warranty Manuals and Record Drawings and Specifications not submitted ten (10) days prior to Substantial Completion inspection.

§ 9.8.9 If the Owner withholds any amounts of retained funds, the Architect/ Engineer, on behalf of the Owner, shall provide an itemization and list of reasons why amounts are being withheld within thirty (30) calendar days of receipt of request.

Add the Sections 9.8.10 through 9.8.13 as follows:

§ 9.8.10 Warranties required by the Contract Documents will commence on the Date of Substantial Completion of the Work unless otherwise provided in the Certificate of Substantial Completion or the

Contract Documents.

§ 9.8.11 Upon execution of the Certificate of Substantial Completion, the Contractor will deliver custody and control of such Work to the Owner. The Owner will thereafter provide the Contractor reasonable access to such Work to permit the Contractor to fulfill the correction, completion and other responsibilities remaining under the Contract and the Certificate of Substantial Completion.

§ 9.8.12 Unless otherwise provided in the Certificate of Substantial Completion, the Contractor must complete or correct all items included in the final Punch List within sixty (60) days, subject to the availability of special order parts and materials, after the Date of Substantial Completion.

§ 9.8.13 Closeout Documentation
Not later than ten (10) days after the date of Substantial Completion, the Contractor shall furnish to the Architect/Engineer all Closeout Documentation identified in General Requirements (Division 1 of the Specifications). Except with the consent of the Owner, the Architect/Engineer will perform Closeout Documentation review only during the sixty (60) day period following Substantial Completion. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect/Engineer for additional reviews beyond the sixty (60) day time period identified.

§ 9.8.14 At the time of Substantial Completion, in addition to removing rubbish and leaving the building "broom clean," the Contractor must replace any broken or damaged materials, remove stains, spots, marks and dirt from decorated Work, clean all fixtures, vacuum all carpets and wet mop all other floors, replace HVAC filters, clean HVAC coils, and comply with such additional requirements, if any, which may be specified in the Contract Documents.

§ 9.10 Final Completion and Final Payment

Delete Sections 9.10.1 through 9.10.5.

Add Sections 9.10.1 and 9.10.1.1 as follows:

§ 9.10.1 When Contractor has completed or corrected all items on final Punch List and considers that Work is complete and ready for final acceptance, Contractor shall give written notice to Owner and Architect/Engineer and request final inspection of Work as provided in Section 9.10.2. Contractor's notice and request for final inspection shall be accompanied by final Application for Payment and Submittals required by Section 9.10.3.

§ 9.10.1.1 The Architect/Engineer will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect/Engineer for any additional inspections.

Add Sections 9.10.2 as follows:

§ 9.10.2 Upon receipt of Contractor's notice and request for final inspection, Owner and Architect/Engineer shall promptly make such inspection and, when Owner and Architect/Engineer concur that Work has been fully completed and is acceptable under Contract Documents, Architect/Engineer will issue Certificate of Final Completion to Owner. Contractor's notice and request for final inspection constitutes representation by Contractor to Owner and Architect/Engineer that the Work has been completed in full and strict accordance with terms and conditions of Contract Documents. Architect/Engineer will promptly notify Contractor if Owner and Architect/Engineer do not concur that Work is finally complete. In such case, Contractor shall bear cost of any additional services or inspection of Owner or Architect/Engineer until Work is determined to be finally complete.

Add Section 9.10.2.1 to Section 9.10.2:

§ 9.10.2.1 The Contractor shall provide Project Record Documents, Operation and Maintenance Manuals, Instruction to Owner's personnel, Final Cleaning and other closeout procedures specified elsewhere.

Add Section 9.10.3 as follows:

§ 9.10.3 Final Payment will be made no earlier than thirty-one (31) days following approval of School Board at regularly scheduled meeting, receipt of all Chapter 573 Claim Releases (equivalent of lien waivers under Iowa law for public improvement projects), Sales Tax Information, and all other required closeout documents, and are subject to conditions of and in accordance with provisions of Iowa Code Chapter 573 and Iowa Code Chapter 26. Owner may withhold from final payment any and all amounts required to reimburse Owner for all costs, fees (including reasonable attorney's fees) incurred as result of any Chapter 573 Claims filed on Project. Neither final payment nor any remaining retained percentage will become due until Contractor submits following documents to Architect/Engineer.

- **.1** Affidavit that payrolls, bills for materials and equipment, and other indebtedness with Work for which Owner or Owner's property might be responsible or encumbered (less amounts withheld by Owner), have been paid or otherwise satisfied, submitted on AIA Document G706, Affidavit of Payment of Debts and Claims (latest edition) or such other form as may be prescribed by Owner;
- **.2** Release or waiver of liens and Iowa Code Chapter 573 claims on behalf of Contractor and similar release or waiver on behalf of each Subcontractor and supplier, accompanied by AIA Document G706A, Affidavit of Release of Liens (latest edition) or such other form as may be prescribed by Owner;
- **.3** Certificate evidencing that Contractor's liability insurance and Performance Bond remain in effect during one-year correction period following Substantial Completion as set forth in Section 12.2.2.1 and 12.2.2.2;
- **.4** Written statement that Contractor knows of no substantial reason that insurance will not be renewable to cover period required by Contract Document(s);
- **.5** Consent of surety to final payment submitted on AIA Document G707 (latest edition) or other form prescribed by Owner;
- **.6** Other data required by Owner establishing payment or satisfaction of obligations, such as receipts, releases and waivers of claims, security interests or encumbrances arising out of Contract, to extend and in such forms as may be prescribed by Owner;
- **.7** Certified building location survey and as-built site plan in form and number required by Contract Documents
- **.8** All warranties and bonds required by Contract Documents; and
- **.9** Record Documents and return of Contract Documents as provided therein.

Add Section 9.11 to Article 9:

§ 9.11 ASSIGNMENT

§ 9.11.1 No assignment by the Contractor of any principal contract or any part thereof, or of the funds to be received thereunder by the Contractor, will be recognized unless such assignment has had the written approval of the Owner and the Surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in the Assignment Contract, the following language must be set forth:

"It is agreed that the funds to be paid to the Assignee under this Assignment are subject to prior lien/Iowa Code Chapter 573 claims for services rendered on materials supplied for the performance of all work called for in said Contract, in favor of all persons, firms or corporations rendering such services supplying such materials."

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.2 Safety Precautions and Programs

Add sub-paragraph 10.1.1 as follows:

10.1.1 Contractor shall take all necessary precautions to keep the site and work in compliance with the safety and health regulations for construction issued by the Bureau of Labor Standards of the U.S. Department of Labor as well as the Occupational Safety and Health Standards parts 1910 and 1926 as amended and as enforced by the State of Iowa.

§ 10.2 Safety of Persons and Property

Add the following text to Sub-paragraph 10.2.2:

Contractors shall also comply with the Iowa Smoke Free Air Act while on Owner Property and shall not smoke any tobacco product while on Owner property. For purposes of this subparagraph, Owner property shall include inside private Contractor or employee owned vehicles while parked on Owner property.

Add Section 10.2.4.1 to Section 10.2.4:

§ 10.2.4.1 When use or storage of explosives, or other hazardous materials, substances or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the Owner reasonable advance notice.

Add Section 10.2.5.1 to Section 10.2.5:

§ 10.2.5.1 Contractors required remedial action for damage and loss to property referred to in Sections 10.2.1.2 and 10.2.1.3 shall repair the damaged materials and surfaces to their original condition, or better, to the satisfaction of the Owner. All such repairs are the responsibility of the Contractor and shall be accomplished at no additional cost to the Owner.

Add Section 10.2.9 to Section 10.2:

§ 10.2.9 Contractor shall at all times, protect the excavation, trenches and/or the buildings from damage or rain water, spring water, ground water, backing up of drains, or sewers, etc. Provide all pumps, equipment, and enclosures to give this protection.

Contractor shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations free of water.

Contractor shall provide all shoring, bracing, and sheeting as required for safety and for the proper execution of the Work. Remove when work is completed.

At end of day's work, all new work likely to be damaged shall be covered. During cold weather protect all work from damage. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, work shall cease after notifying Architect/Engineer. All other protective measures not mentioned above which may be required shall be furnished by the particular Contractor responsible for such protection.

§ 10.3 Hazardous Materials and Substances

Modify Section 10.3.1 by deleting the word "notify" in line six and replacing it with the words "report the condition in writing to".

§ 10.4 Emergencies

Delete Section 10.4 and substitute the following:

In an emergency affecting safety of persons or property, the Contractor must take all necessary action, without the necessity for any special instruction or authorization from the Owner or Architect, to prevent threatened damage, injury or loss. The Contractor must promptly, but in all events with twenty-four (24) hours of the emergency, report such action in writing to the Owner and Architect. If the Contractor incurs additional costs on account of or is delayed by such emergency, the Contractor may request a change in the Contract Sum or Contract Time to account for such additional costs or delay in accord with Articles 7, 8 and 15. The Contractor must file any such request within ten (10) days of the emergency or it is deemed waived. Any adjustment in the Contract Sum or Contract time shall be limited to the extent that the emergency work is not attributable to the fault or neglect of the Contractor or otherwise the responsibility of the Contractor under the Contract Documents.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

Section 11.1.1 shall be deleted and replaced with Exhibit A to these Supplementary Conditions, which is attached hereto and incorporated by reference herein.
Section 11.1.2 shall be deleted and replaced with the following:

11.1.2 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to one hundred percent (100%) of the Contract Sum.

- **.1** The Contractor shall deliver the required bonds to the Owner not later than ten (10) 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.
- **.2** The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.
- **.3** The Contractor shall require the bonding company to be registered with authority to transact business in State of Iowa.

§ 11.2 Owner's Insurance

Add the following sentence to Section 11.2.1:

Owner's "all risk" insurance will be provided by Owner with customary exclusions of certain perils.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK
§ 12.1 Uncovering of Work

Add the words "upon written authorization from Owner" between the words "Architect" and "be uncovered" in 2nd line of Section 12.1.1.

Add the words "upon written authorization from Owner" between the words "any request" and "to see" in 2nd line of Section 12.1.2.

§ 12.2.1 Before Substantial Completion

Delete Section 12.2.1 and substitute the following:

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.

Delete Section 12.2.2.1 and substitute the following:

§ 12.2.2.1 In addition to Contractor's obligations under Section 3.5, if, within two (2) years after date of Substantial Completion of Work or designated portion thereof or after date of commencement of warranties established under any other provision of Contract Documents, or by terms of an applicable special warranty required by Contract Documents, any of Work is found not to be in accordance with requirements of Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of condition. Before commencing correction of Work, Contractor shall submit to Owner written description of their proposed repairs. This proposal shall be approved by Design Professional before Contractor commences repair. Once Contractor has completed repair work, they shall notify Owner and Design Professional who shall promptly review corrected work. If Design Professional or Owner rejects corrected Work, Contractor shall continue with repairs until such time as Design Professional and Owner accept corrected Work. Where Contractor corrects defective Work during initial two (2) year period after Substantial Completion, if Owner discovers defects in corrected Work within one (1) year after repairs are made, then Contractor shall be obligated, upon written notice from Owner, to correct such defects within one (1) year from date that repairs were made.

Modify Section 12.2.2.2, line 1 from "one year" to "two (2) years."

Modify Section 12.2.2.3, line 1 from "one year" to "two (2) years."

Modify Section 12.2.5, line 2 from "one year" to "two (2) years."

Add Section 12.2.6 to Section 12.2 as follows:

§ 12.2.6 If Contractor fails or refuses to correct Work in accordance with their obligations under Contract Documents after written notice from Owner, then Owner may correct Work and Contractor shall be liable for costs to correct Work, any related architectural, engineering or other consulting costs, attorney's fees and expenses, and fines or penalties, if any. Any amounts due to Owner from Contractor under this Section may be withheld from balance of Contract Sum not yet paid.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

Delete Section 13.1 and substitute the following:

§ 13.1 Governing Laws
The Contractor shall be governed by the laws of the State of Iowa.

Add Section 13.1.1 to Section 13.1 as follows:

§ 13.1.1 Compliance with Law Provision: the Contractor agrees that it will comply with all applicable Federal, State and local laws, statutes, codes, rules, and regulations having jurisdiction over the Project. Contractor shall take all necessary precautions to keep the site and work in compliance with the safety and health regulations for construction issued by the Bureau of Labor Standards of the U.S. Department of Labor as well as the Occupational Safety and Health Standards, as amended and as enforced by the State of Iowa.

§ 13.2 Successors and Assigns

Delete Section 13.2.2.

§ 13.4 Tests and Inspections

Add the following after the 2nd sentence in Section 13.5.1:

“Contractor shall schedule all tests, inspections, or specific approvals required by law or Contract Documents so as to avoid any delay in Work.”

Delete last 2 sentences of Section 13.4.1.

Add Section 13.4.7 to Section 13.4.

§ 13.4.7 In addition to tests required by Section 13.5, Owner may at any time arrange for other tests, inspections and specific approvals to be performed by others selected by Owner, at Owner’s expense. Contractor shall cooperate with Owner and provide access to Work for such tests, inspections and approvals.

§ 13.5 Interest

Delete Section 13.5 text and substitute the following:

“Payments due and unpaid under Contract Documents shall bear interest from date payment is due and shall bear interest at rate established in Iowa Code Section 74A.2 or Iowa Code Section 573.14, whichever is less.”

Add Sections 13.6 through 13.11 to Article 13:

§ 13.6 Owner’s Right to Occupy
Owner shall have the right to occupy, without prejudice to rights of either party, any completed or largely completed portion of structure or Work, notwithstanding the fact that time for completing entire Work, or such portion thereof, may not have expired. Such occupancy and use shall not be an acceptance of Work taken or used.

§ 13.7 Rebates
Owner shall have the right to apply for, and secure all rebates which are available when Bids are received. Contractor shall provide invoices, itemizations, and cooperation to the Owner in this regard.

§ 13.8 Conformance with Laws
The Contractor shall conform with provisions of Federal Civil Rights Act, the Code of Iowa, Chapter 216 Civil Rights Commission and rules and regulations adopted thereto by the Iowa Civil Rights Commission. The Contractor shall comply with applicable federal, state, and local laws, rules, regulations, ordinances, policies and procedures, including Owner’s policies and procedures, and Iowa Smoke Free Air Act. The Contractor shall require similar clauses in all of their subcontracts for service or materials.

§ 13.9 Equal Opportunity
§ 13.9.1 The Contractor shall maintain policies of employment as follows:

§ 13.9.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, creed, religion, color, sex, national origin, ancestry, familial status, age, mental or physical disability, sexual orientation, gender identity, genetic information or any other protected class under state or federal law. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, creed, religion, color, sex or national origin, ancestry, familial status, age, mental or physical disability, sexual orientation, gender identity, genetic information or any other protected class under state or federal law. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor

agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.9.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, creed, religion, color, sex, national origin, ancestry, familial status, age, mental or physical disability, sexual orientation, gender identify, genetic information or any other protected class under state or federal law.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

Delete Section 14.1.1 and substitute the following:

§ 14.1.1 Contractor has no right to stop Work as consequence of non-payment. In event of any disagreement between Contractor and Owner involving Contractor's entitlement to payment, Contractor's only remedy is to file Claim in accordance with Article 15. Contractor shall diligently proceed with Work pending resolution of Claim.

.1 If, however, an Application for Payment has been approved for payment by Owner, and Owner fails to make payment within sixty (60) days of approval of payment by Owner, Contractor may upon ten (10) day written notice to Owner, stop work if payment is not made by Owner within ten (10) days following notice.

Delete Sections 14.1.2 through 14.1.4 in their entirety.

§ 14.2 Termination by the Owner for Cause

Delete Sections 14.2.1 through 14.2.4 and substitute the following:

§ 14.2.1 Owner may terminate Contract for cause if Contractor:

.1 Fails to supply adequate properly skilled workers or proper materials;

.2 Fails to make payment to Subcontractors or Suppliers for materials or labor in accordance with respective agreements between Contractor and Subcontractors or Suppliers;

.3 Fails to comply with any laws, ordinances, or rules, regulations or orders of public authority having jurisdiction;

.4 Fails to perform Work in accordance with Contract Documents or otherwise breaches any provision of Contract Documents;

.5 Anticipatorily breaches or repudiates Contract;

.6 Fails to make satisfactory progress in prosecution of Work required by Contract; or

.7 Endangers performance of Contract.

§ 14.2.2 Owner may terminate Contract, in whole or in part, whenever Owner determines that sufficient grounds for termination exist as provided in Section 14.2.1. Owner will provide Contractor with written notice to cure default. If default is not cured, termination for default is effective on date specified in Owner's written notice. However, if Owner determines that default contributes to curtailment of an essential service or poses an immediate threat to life, health, or property, Owner may terminate Contract immediately upon issuing oral or written notice to Contractor without any prior notice or opportunity to cure. In addition to any other remedies provided by law or Contract, Contractor shall compensate Owner for additional costs that foreseeably would be incurred by Owner, whether costs are actually incurred or not, to obtain substitute performance. Termination for default is termination for convenience if termination for default is later found to be without justification.

§ 14.2.3 Upon receipt of written notice from Owner of termination, Contractor shall:

.1 Cease operations as directed by Owner in notice and, if required by Owner and County, participate in an inspection of Work with Owner, County and Architect/Engineer to record extent of completion thereof to identify Work remaining to be completed or corrected, and to determine what temporary facilities, tools, equipment and construction machinery are to remain at Site pending completion of Work;

.2 Complete or correct items directed by Owner, and take actions necessary, or that Owner may direct, for protection and preservation of any stored materials and equipment and completed Work;

.3 Unless otherwise directed by Owner, remove their tools, equipment and construction machinery from Site; and

.4 Except as directed by Owner, terminate all existing subcontracts and purchase orders and enter into no further subcontracts or purchase orders.

§ 14.2.4 Following written notice from Owner of termination, Owner may:

.1 Take possession of Site and all materials and equipment thereon, and at Owner's option, such temporary facilities, tools, construction equipment and machinery thereon owned or rented by Contractor that Owner elects to utilize in completing Work;

.2 Accept assignment of subcontracts and purchase orders, and

.3 Complete Work by whatever reasonable method Owner may deem expedient.

Add Sections 14.2.5 through 14.2.9 to Section 14.2:

§ 14.2.5 Upon termination for cause, Contractor shall take those actions descried in Section 14.2.3, and Owner may take those actions described in Section 14.2.4, subject to prior rights of Contractor's Surety, as applicable.

§ 14.2.6 When Owner terminates Contract for cause, Contractor is not entitled to received further payment until Work is completed and costs of completion have been established.

§ 14.2.7 If unpaid balance of Contract Sum less amounts which Owner is entitled to offset from unpaid Contract balance, including actual or Liquidated Damages, compensation for Architect/Engineer's services and expenses made necessary thereby, and other damages and expenses incurred by Owner, including reasonable attorney's fees, exceeds cost of completing Work, including compensation for Owner's and Architect/Engineer's services made necessary thereby, such excess will be paid to Contractor or Surety, as directed by Surety. If such costs exceed unpaid Contractor balance, Contractor shall pay difference to Owner upon written demand. This obligation for payment shall survive termination of Contract.

§ 14.2.8 In completing Work following termination for cause, Owner is not required to solicit competitive bids or to award completion work to lowest bidder, but may obtain such completion work and related services on basis of sole source procurement and negotiated compensation.

§ 14.2.9 If Contractor files for protection, or petition is filed against it, under Bankruptcy laws, and Contractor wishes to affirm Contract, Contractor shall immediately file with Bankruptcy Court motion to affirm Contract and shall provide satisfactory evidence to Owner and to Court of their ability to cure all present defaults and their ability to timely and successfully complete Work. If Contractor does not make such an immediate filing, Contractor accepts that Owner shall petition Bankruptcy Court to lift Automatic Stay and permit Owner to terminate Contract.

§ 14.4 Termination by the Owner for Convenience

Delete Sections 14.4.1 through 14.4.3 and substitute the following:

§ 14.4.1 Owner may, at any time, terminate the Contract or any portion thereof or Work for Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from Owner of termination, Contractor shall:

.1 Cease operations as directed by Owner in notice and, if required by Owner, participate in inspection of Work with Owner and Architect/Engineer to record extend of completion thereof, to identify Work remaining to be completed or corrected, and to determine what temporary facilities, tools, equipment and construction machinery are to remain at Site pending completion of Work;

.2 Complete or correct items directed by Owner, and take actions necessary, or that Owner may direct, for protection and preservation of stored materials and equipment and completed Work.

.3 Unless otherwise directed by Owner, remove their tools, equipment and construction machinery from Site, and

.4 Except as directed by Owner, terminate all existing subcontracts and purchase orders related to Work and enter into no further subcontracts of purchase orders thereof.

§ 14.4.3 Following written notice from Owner of termination, the Owner may:

.1 Take possession of Site and of all materials and equipment thereon, at Owner's option, such temporary facilities, tools, construction equipment and machinery thereon owned or rented by Contractor that Owner elects to utilize in completing Work;

.2 Accept assignment of subcontracts and purchase orders; and

.3 Complete Work by whatever reasonable method Owner may deem expedient.

Add Section 14.4.4 and 14.4.5 to Section 14.4:

§ 14.4.4 In case of termination for Owner's convenience, Contractor will be entitled to compensation only for following items:

.1 Payment for acceptable Work performed up to date of termination;

.2 Costs of preservation and protection of Work if requested to do so by Owner;

.3 Cost of terminating following contracts including:

a. Purchased materials but only if not returnable and provided to Owner, or restocking or return charge, if any, if returnable at Owner's written election;

b. Equipment rental contracts if not terminable at no cost but not to exceed an amount equal to thirty (30) day rental;

c. Documented transportation costs associated with removing Contractor-owned equipment;

d. Documents demobilization and close-out costs; and

e. Overhead and profit on foregoing not to exceed ten (10) percent.

.4 Contractor will not be compensated for cost of terminating subcontracts, which shall be terminable at no cost to Owner if Contract is terminated.

.5 Contractor will not be compensated for cost of any idled employees unless employee is underwritten employment contract entitling employee to continued employment after termination of Contract and employee cannot be assigned to other Work provided that in all events Contractor's costs shall be limited to thirty (30) days of employment costs from date of notice of termination. Contractor shall not be entitled to any other costs or compensation (including lost or expected profit, uncompensated overhead or related expenses, or cost of preparing and documenting their compensable expenses under this Section 14.4.4 as consequence of Owner's termination of Contract for convenience). Contractor conclusively and irrevocably waives their right to any other compensation or damages (compensation or Punitive) arising from termination of Contract. If Owner and Contractor are unable to agree upon amounts specified in this Section, Contractor may submit Claim as provided in Article 15. Claim must be limited to resolution of amounts specified in Section 14.4.4.1, 14.4.4.2, 14.4.4.3, and14.4.4.4 of Section 14.4.4. No other cost, damages or expenses may be claimed or paid to Contractor or considered as part of Claim, same being hereby conclusively and irrevocably waived by Contractor. Any such Claim shall be delivered to Owner within thirty (30) days of termination of Contract and shall contain written statement setting forth specific reasons and supporting

calculations and documentation as to amounts Contractor claims to be entitled to under this Section as result of termination of Contract.

§ 14.4.5 Contractor's obligations surviving final payment under Contract, including without limitation those with respect to insurance, indemnification, and correction of Work that has been completed at time of termination, remains effective notwithstanding termination for convenience of Owner.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1.1 Definition

Delete Section 15.1.1 text and substitute the following:

"A Claim is a written demand or assertion by Contractor seeking, as matter of right, payment of money, a change in the Contract Time, or other relief with respect to terms of Contract. Responsibility to substantiate Claims shall rest with Contractor. Nothing contained in this section is intended to apply to or in any way limit Owner's right to make claims related to or arising out of Contract."

§ 15.1.2 Time Limits on Claims

Delete the words "Substantial Completion" in line 4 of Section 15.1.2 and replace it with "Final Acceptance."

Delete the last sentence of Section 15.1.2

§ 15.1.3 Notice of Claims

Delete Section 15.1.3.1 and substitute the following:

§ 15.1.3.1 Claims by Contractor shall be initiated by written notice to Owner and to Initial Decision Maker with copy sent to Architect/Engineer, if Architect/Engineer is not serving as Initial Decision Maker. Claims by Contractor shall be initiated within ten (10) days after occurrence of event giving rise to such Claim or within ten (10) days after Contractor first recognizes condition giving rise to Claim, whichever is later. As condition of making claim for additional costs, Contractor shall maintain and produce accurate records to substantiate all additional costs actually incurred. If Claim for actual cost is approved, Owner shall pay Contractor actual costs incurred plus either (a) ten percent (10%) for overhead and profit for work performed by Contractor, or (b) five percent (5%) overhead and profit for work performed by subcontractor, as applicable.'

§ 15.1.4 Continuing Contract Performance

Delete Section 15.1.4.1 and substitute the following:

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

§ 15.1.6 Claims for Additional Time

Delete Section 15.1.6.2 and substitute the following:

§ 15.1.6.2 If adverse weather conditions are the basis of a Claim for additional time, the Claim shall be documented by data substantiating that the weather conditions upon which the Claim is based (1) were abnormal when compared to the previous 5-year period, during the same time frame and at the location of the Work, (2) could not have been reasonably anticipated, and (3) had an adverse effect on the date of substantial completion of the Work.

Add Sections 15.1.6.3 and 15.1.6.4 to Section 15.1.6:

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 15.1.7 Waiver of Claims for Consequential Damages

Delete Section 15.1.7.

§ 15.2 Initial Decision

Modify the first sentence of Section 15.2.1 to read as follows:

"Claims, excluding those arising under Sections 10.3, 10.4 and 11.5 shall be referred to the Initial Decision Maker for initial decision."

Delete Section 15.2.6 and substitute the following:

§ 15.2.6 The parties may file for mediation of an initial decision at any time, upon mutual agreement of the parties.

Delete Section 15.2.6.1.

Delete Section 15.2.8 and replace with the following:

"If a Claim relates to or is the subject of an Iowa Code Chapter 573 Claim, the party asserting such Claim may proceed in accordance with Iowa Code Chapter 573 to comply with the Iowa Code Chapter 573 notice and/or filing deadlines prior to resolution of the Claim by the Architect or by mediation."

§ 15.3 Mediation

Delete Section 15.3.1.

Delete Section 15.3.2 and substitute the following:

§ 15.3.2 The parties shall endeavor in good faith to resolve claims, disputes and other matters in question between them by mutual agreement and may, by mutual agreement and in their discretion, submit same to non-binding mediation which shall be in accordance with Iowa Code Chapter 679C, unless otherwise mutually agreed upon by the parties. Requests for mediation shall be given in writing to the other Party to this Agreement. If the Owner and Contractor are unable to mutually agree upon mediator in writing within sixty (60) days of receiving written request for mediation, either party may then institute legal or equitable proceedings. Mediation shall be voluntary only and shall not be a prerequisite to litigation or other means of dispute resolution.

Delete Section 15.3.3

Delete Section 15.4 substitute the following:

§ 15.4 Litigation

§ 15.4.1 Any legal claim brought under this Agreement shall be filed in the Iowa District Court in and for Polk County, unless otherwise mutually agreed to by the parties.

Add Article 16 as follows:

ARTICLE 16 SMOKING AND RELATED ADVERTISING
§ 16.1 Smoking will not be allowed on Owner's property, which shall include inside private vehicles parked on Owner's property. In addition, employees of Contractor, Subcontractors, and materials suppliers shall not wear apparel that advertises tobacco, alcohol, or illicit drugs, nor has profane language or images on them.

END OF DOCUMENT

APPENDIX A

SOUTHEAST POLK COMMUNITY SCHOOL DISTRICT

MINIMUM INSURANCE REQUIREMENTS:

COMMERCIAL GENERAL LIABILITY:

General Aggregate Limit	$2,000,000
Products - Completed Operation Aggregate Limit	$2,000,000
Personal and Advertising Injury Limit	$1,000,000
Each Occurrence Limit	$1,000,000
Damage to a Premises Rented to You Limit	$ 100,000
Medical Payments	$ 5,000

Commercial General Liability policy shall be written on an occurrence form using ISO form CG 00 01 or equivalent form.

Policy shall include the following endorsements:

1. ISO endorsement CG 20 10 or equivalent endorsement naming the Southeast Polk Community School District, its board members, employees and agents as an additional insured.

2. ISO endorsement CG 20 32 or equivalent endorsement naming Project Engineers, Architects and Surveyors as an additional insured.

3. ISO endorsement CG 20 37 or equivalent endorsement naming the Southeast Polk Community School District, its board members, employees and agents as an additional insured for completed operations. This endorsement shall be maintained for a minimum of two years after completion and acceptance of the project by the Southeast Polk Community School District.

4. ISO Endorsement CG 20 01 or equivalent endorsement indicating additional insured status for the Southeast Polk Community School District, its board members, employees and agents is primary and non-contributory.

5. ISO endorsement CG 25 03 or equivalent endorsement, Designated Construction Project(s) General Aggregate Limit.

6. ISO endorsement CG 24 04 or equivalent endorsement, Waiver of Transfer of Rights of Recovery Against Others to Us, naming the Southeast Polk Community School District.

7. Governmental Immunities Endorsement (see attached specimen).

BUSINESS AUTOMOBILE LIABILITY:

Combined single limit of	$1,000,000

Or

Bodily Injury (per person)	$1,000,000
Bodily Injury (per accident)	$1,000,000
Property Damage	$1,000,000

Business auto liability shall be written on ISO form CA 00 01 or equivalent form.

1. Policy shall include Symbol 1 (Any Auto). If no owned autos, hired and non-owned auto liability is acceptable.

2. Include ISO endorsement CA 04 44 or equivalent endorsement, Waiver of Transfer of Rights of Recovery Against Others to Us, naming the Southeast Polk Community School District.

3. Include ISO endorsement CA 99 48, Pollution Liability – Broadened Coverage for Covered Autos, or equivalent endorsement if the Contractor has vehicles that transport fuel onto Southeast Polk Community School District property.

WORKERS COMPENSATION & EMPLOYERS LIABILITY:

1. Workers Compensation – Statutory – State of Iowa

2 Employers Liability

Bodily Injury Limit Each Accident	$500,000
Bodily Injury Disease – Policy Limit	$500,000
Bodily Injury Disease – Limit Each Employee	$500,000

Workers Compensation shall include the following endorsement: WC 0003 13, Waiver of Our Right to Recover from Others, in favor of the Southeast Polk Community School District.

Sole Proprietors, Partners and Members must be included for coverage. Executive Officers may not be excluded from coverage.

UMBRELLA OR EXCESS LIABILITY:

Limit Each Occurrence	$5,000,000
Aggregate Limit	$5,000,000

Umbrella or Excess liability policy shall provide excess coverage and be at least as broad in coverage as the following required policies and endorsements: Commercial General Liability, Business Auto and Employer's Liability.

SOUTHEAST POLK COMMUNITY SCHOOL DISTRICT
GOVERNMENTAL IMMUNITIES ENDORSEMENT

1. Nonwaiver of Governmental Immunity. The insurance carrier expressly agrees and states that the purchase of this policy and the including of Southeast Polk Community School District as an Additional Insured does not waive any of the defenses of governmental immunity available to the Southeast Polk Community School District under Code of Iowa Section 670.4 as it now exists and as it may be amended from time to time.

2. Claims Coverage. The insurance carrier further agrees that this policy of insurance shall cover only those claims not subject to the defense of governmental immunity under the Code of Iowa Section 670.4 as it now exists and as it may be amended from time to time. Those claims not subject to Code of Iowa Section 670.4 shall be covered by the terms and conditions of this insurance policy.

3. Assertion of Governmental Immunity. The Southeast Polk Community School District shall be responsible for asserting any defense of governmental immunity and may do so at any time and shall do so upon the timely written request of the insurance carrier.

4. Non-Denial of Coverage. The insurance carrier shall not deny coverage under this policy and the insurance carrier shall not deny any of the rights and benefits accruing to the Southeast Polk Community School District under this policy for reasons of governmental immunity unless and until a court of competent jurisdiction has ruled in favor of the defense(s) of governmental immunity asserted by the Southeast Polk Community School District.

No Other Change in Policy. The above preservation of governmental immunities shall not otherwise change or alter the coverage available under the policy.

APPENDIX B

ACKNOWLEDGMENT AND CERTIFICATION

[Insert name of vendor/supplier/contractor/subcontractor] ("Company") is providing services to the SOUTHEAST POLK Community School District ("District"), as a vendor, supplier, contractor or subcontractor and/or is operating or managing the operations of a vendor, supplier, or contractor. The services provided by the Company may involve the presence of Company's employees upon the real property of the schools of the District.

The Company acknowledges that the Iowa law prohibits a sex offender who has been convicted of a sex offense against a minor from being present upon the real property of the schools of the District. The Company further acknowledges that, pursuant to law, a sex offender who has been convicted of a sex offense against a minor may not operate, manage, be employed by, or act as a contractor, vendor or supplier of services or volunteer at the schools of the District.

The Company hereby certifies that no one who is an owner, operator or manager of the Company has been convicted of a sex offense against a minor. The Company further agrees that it shall not permit any person who is a sex offender convicted of a sex offense against a minor to provide any services to the District in accordance with the prohibitions set forth above.

This Acknowledgment and Certification is to be construed under the laws of the State of Iowa. If any portion hereof is held invalid, the balance of the document shall, notwithstanding, continue in full legal force and effect.

In signing this Acknowledgment and Certification, the person signing on behalf of the Company hereby acknowledges that he/she has read this entire document, that he/she understands its terms, and that he/she not only has the authority to sign the document on behalf of the Company but has signed it knowingly and voluntarily.

Date: _____

_____
[insert name of contractor or subcontractor]
By: _____
Name: _____
Title: _____

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CONTRACTOR'S INSURANCE REQUIREMENTS

In the event of a conflict between the AIA contract and the insurance requirements below, the broader coverage will apply.

A. **Contractor's Insurance**. Contractor shall purchase and maintain, the following insurance without interruption from the date of commencement of the Work until the date of final payment and for the additional periods specified herein:

1. **Commercial General Liability** insurance on an "occurrence" basis on an ISO CG 0001 or an equivalent form for bodily injury and property damage that may arise out of or result from Contractor's operations and completed operations under the Agreement, whether such operations be by Contractor or by a subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Such insurance shall include each of the following:
   (a) At a minimum, the following limits and coverages:
      (i) $1,000,000 each occurrence
      (ii) $1,000,000 personal and advertising injury
      (iii) $2,000,000 general aggregate
      (iv) $2,000,000 products-completed operations aggregate
   (b) Coverage for ongoing operations, independent contractors, and any persons or entities performing work on behalf of Contractor.
   (c) Products and completed operations coverage, which coverage shall be maintained in effect for a period equivalent to the **statute of repose** for the state in which the Project is located.
   (d) A CG 2503 endorsement (or equivalent endorsement acceptable to Owner) stating that "limits apply per project."
   (e) Contractual liability coverage to the same or greater extent as covered under ISO commercial general liability coverage form CG 0001 10 04.
   (f) Contain a severability or separation of insureds clause
   (g) A Form No. CG 2026 11 85 and CG 2037 10 01 together as additional insured endorsements, or an equivalent endorsement acceptable to Owner, naming the entities (as defined on Schedule A to this Exhibit) as additional insureds.
   (h) Provide that such insurance is primary and non-contributing to any insurance available to the project owners, it's employees, lenders and agents and representatives.

.

Contractor shall not permit any Subcontractors of any tier to commence work on or relating to the Project until such Subcontractor has complied with the insurance requirements set forth in this Exhibit. Contractor shall be responsible to Owner for any Subcontractor's failure to comply with the requirements of this Exhibit as they apply to such Subcontractor.

2. **Business Automobile Liability** coverage to include owned, hired and non-owned automobile liability insurance covering all use of all automobiles, trucks and other motor vehicles utilized by Contractor or its Subcontractors, including each of the following:
   (a) A combined single limit for bodily injury and property damage of $1,000,000 per accident.
   (b) Coverage for upset, overturn and collision coverage related to pollution events (applying to the vehicle, trailer or other attachments to vehicle and extend to cargo/waste carried and to Subcontractors or others providing services to Contractor*).*
   (c) An additional insured endorsement acceptable to Owner, naming the entities (as defined on Schedule A to this Exhibit) as additional insureds.

3. Follow-form **Umbrella (Excess) Liability** insurance with a limit of _____ each occurrence in excess of the general liability, employer's liability and business automobile liability coverages required of Contractor under this Exhibit. Such insurance shall contain a provision that it will not be more restrictive than the primary insurance. Aggregate limits of liability shall apply separately with respect to the Project. Additional insured is following form to the primary.

4. **Workers' Compensation insurance**, including employer's liability, for all persons whom Contractor employs (or uses as subcontract labor if the Subcontractor is uninsured) in carrying out any Work. Such insurance shall be in strict compliance with the requirements of the most current and applicable workers' compensation insurance laws in effect from time to time in the state(s) where the Work is performed, and shall include the following:

   (a) Coverage A (Workers' Compensation) - Statutory

   (b) Coverage B (Employer's Liability)
   At a minimum, the following limits and coverages:
      (i) $1,000,000 for each accident, for bodily injury by accident
      (ii) $1,000,000 for each employee, for bodily injury by disease
      (iii) $1,000,000 for each disease policy limit

   (c) An endorsement that waives all subrogation rights the insurer may have to recover damages against (i) Owner and its agents, officers, directors, affiliates, and employees, and (ii) parties with respect to which waivers of subrogation are required by contracts executed in connection with the Project, to the extent such damages are covered by the workers' compensation insurance.

   (d) Contain endorsements that provide:
      (i) Voluntary Compensation

(ii) United States Longshoreman's and Harbor Workers' Compensation (if applicable)

B. **Additional Requirements for All Policies.** Each insurance policy required under this shall:

Except as otherwise agreed in writing by Owner, be issued by insurance carriers duly authorized to transact that class of insurance in the State where work is located, having a general policyholder's rating of not less than an "A-" and financial rating of not less than "VII " in the most current Best's Key Rating Guide;

Contain a provision that the policy shall not be subject to material alteration to the detriment of Owner or Contractor or cancellation or non-renewal without at least 30 days' prior notice being given to Owner by registered mail;

Contain a provision that Contractor's waiver of subrogation per paragraph F. below is allowed by all policies required herein.

C. **Evidence of Required Coverage**. As evidence of the insurance coverage required by this Agreement, Owner will accept certificates issued by Contractor's insurance carrier acceptable to Owner showing such policies in force for the specified period. Such evidence shall be delivered to Owner prior to or promptly upon execution of this Agreement. Owner may request a certified copy of each such policy required to be obtained and maintained by Contractor pursuant to this Agreement, in which case Contractor shall, within a reasonable period of time, provide such certified copies. Evidence of any renewal insurance shall be delivered to Owner not less than 30 days prior to the expiration date on the term of the policy. Each policy and certificate shall be subject to reasonable approval by Owner. Any reduction or waiver of any of Contractor's insurance requirements under this Agreement may be made only by a written document signed by Owner and Contractor which expressly amends the pertinent described portions of this Exhibit.

D. **Subcontractors' Insurance**. Contractor shall not permit any Subcontractor (of any tier) to commence work on or relating to the Project until such parties have complied with the insurance requirements set forth in this Exhibit C, provided that Owner may, in its sole discretion agree, in writing to reduce such requirements for a Subcontractor. Contractor shall cause each such party to name Owner and each of the entities listed on Schedule A to this Exhibit C attached hereto as Additional Insureds to such Subcontractor's policies.

E. **Additional Coverage or Limits.** These are minimum requirements only and shall not restrict, limit or relieve the Contractor of or from its obligations under the Contract Documents. Further, failure of the Contractor to secure insurance coverages or failure to comply fully with any of the insurance provisions of the Contract Documents shall in no way restrict, limit or relieve the Contractor of or from its obligations under the Contract Documents.

F. **Waiver of Subrogation**. Contractor hereby waives all rights against Owner and all other Insureds for damages caused by fire and other perils and any other risk to the extent covered by Contractor's policies of insurance or required to be covered by Contractor's policies of insurance as set forth above.

Schedule A to Exhibit
LIST OF ADDITIONAL INSUREDS

_____

_____

_____

_____

_____

and each of their respective, related or affiliated entities, parents, subsidiaries, holding entities, partnerships, joint ventures, limited liability companies, and assigns of every tier and each of their respective members, managers, partners, officers, directors, shareholders, and employees (collectively, with any other entities Owner may from time to time require to be listed as additional insureds, the "**Additional Insureds**")

CONTRACTOR REQUIRED INEMNIFICATION

To the fullest extent allowed by law, Contractor shall indemnify and hold harmless the Owner, its agents, directors, employees, officers and affiliates from and against all claims, damages, losses and expenses, including but not limited to reasonable attorney fees, arising out of or resulting from the Work described in this Agreement, to the extent such claims, damages, losses or expenses are caused by the negligence or willful misconduct of the Contractor, its subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, and attributable to bodily injury, sickness, disease or death or destruction of tangible property, except to the extent such claims, damages, losses or expenses are caused by the negligence or willful misconduct of a party indemnified hereunder.

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Work performed by Owner.
   4. Owner-furnished/Contractor-installed (OFCI) products.
   5. Contractor's use of site and premises.
   6. Coordination with occupants.
   7. Work restrictions.
   8. Specification and Drawing conventions.

B. Related Requirements:
   1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Bus Maintenance Facility, Southeast Polk Community School District.
   1. Project Location: 8415 NE University Avenue, Pleasant Hill, IA 50327 .

B. Owner: Southeast Polk Community School District, 8031 NE University Avenue, Pleasant Hill, IA 50327 .

C. Architect: RDG Planning & Design, 301 Grand Avenue, Des Moines, Iowa 50309.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
   1. New construction of a bus maintenance facility. Work includes related mechanical and electrical construction, site development, site utilities, and site paving.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

C. Commencement of Work On-Site: Work may commence on-site on <**Insert Commencement of Work On-Site**>.

D. Project Completion: Sequence the Work to achieve Substantial Completion on or before <CompletionDate>.

1.4 WORK PERFORMED BY OWNER

A. Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.5 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
   1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.

2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:
1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products: As indicated on Drawings.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways 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 by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: No limitations; comply with City of Pleasant Hill restrictions.

C. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

D. Employee Screening: Comply with Owner's requirements for screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: .

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 00 26 00 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
   2. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use facsimile of form provided in Project Manual.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.
      g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
      h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
      i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
      j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided

within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 SUBMITTAL PROCEDURES

A. Prepare proposal requests as PDF electronic files and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.
8. Submit or post proposal requests using Portable Data File (PDF) format.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SUBMITTAL PROCEDURES

A. Prepare schedule of values and Applications for Payment as PDF electronic files and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Owner's name.
      c. Name of Architect.
      d. Architect's Project number.
      e. Contractor's name and address.
      f. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site.

6. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
1. Other Application for Payment forms proposed by the Contractor shall be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide name and location of storage facility, detailed list of stored materials, certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit PDF electronic file of signed and notarized original copy of each Application for Payment to Architect via electronic transmission procedure established for Project. Include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).
   6. Schedule of unit prices.
   7. Submittal schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
   9. List of Contractor's principal consultants.
   10. Copies of building permits.
   11. Initial progress report.
   12. Report of preconstruction conference.
   13. Certificates of insurance and insurance policies (submit with executed Agreement).
   14. Performance and payment bonds (submit with executed Agreement).

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
      a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706.
   5. AIA Document G706A.
   6. AIA Document G707.
   7. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. RFIs.
   4. Digital project management procedures.
   5. Project meetings.

B. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 SUBMITTAL PROCEDURES

A. Prepare submittals and other documents required by this Section as PDF electronic files and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.

1.4 INFORMATIONAL SUBMITTALS

A. 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, telephone number, and email address 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.

B. Key Personnel Names: Submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room and temporary field office, and in web-based Project software directory. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Owner name.
3. Project number.
4. Date.
5. Name of Contractor.
6. Name of Architect.

7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Contractor shall promptly respond. Architect’s response may be withheld until additional contractor information is provided.
3. Architect's action on RFIs does not authorize a change to the Contract Time or the Contract Sum.
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response and submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    b. No change to the Contract Documents impacting cost or time shall proceed unless directed by a fully executed contract change document.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of AIA Document C106-2013, Digital Data Licensing Agreement included in Project Manual following this Section.
4. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

B. Web-Based Project Software: Use Architect's web-based Project software site for purposes of managing Project documentation during construction phase.
1. No fee or special software other than internet access is required for access to or use of web-based software website.
2. Specific access instructions will be provided following Award of Contract.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of executed Agreement, bonds and insurance certificates.
    m. Distribution of the Contract Documents.

n. Submittal procedures.
o. Sustainable design requirements.
p. Preparation of Record Documents.
q. Use of the premises.
r. Work restrictions.
s. Working hours.
t. Owner's occupancy requirements.
u. Responsibility for temporary facilities and controls.
v. Procedures for moisture and mold control.
w. Procedures for disruptions and shutdowns.
x. Construction waste management and recycling.
y. Parking availability.
z. Office, work, and storage areas.
aa. Equipment deliveries and priorities.
bb. First aid.
cc. Security.
dd. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference to coincide with regular progress meeting, no later than 60 days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
      a. Preparation of Record Documents.
      b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
      c. Procedures for completing and archiving web-based Project software site data files.
      d. Submittal of written warranties.
      e. Requirements for completing sustainable design documentation.
      f. Requirements for preparing operations and maintenance data.
      g. Requirements for delivery of material samples, attic stock, and spare parts.
      h. Requirements for demonstration and training.
      i. Preparation of Contractor's punch list.
      j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
      k. Submittal procedures.
      l. Coordination of separate contracts.
      m. Owner's partial occupancy requirements.
      n. Installation of Owner's furniture, fixtures, and equipment.
      o. Responsibility for removing temporary facilities and controls.
   4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.
   1. Coordinate dates of meetings with preparation of payment requests.
   2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
         1) Review schedule for next period.
      b. Review present and future needs of each entity present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Status of submittals.
         4) Status of sustainable design documentation.
         5) Deliveries.
         6) Off-site fabrication.

7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of Proposal Requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Status of submittals.
         4) Deliveries.
         5) Off-site fabrication.
         6) Access.
         7) Site use.
         8) Temporary facilities and controls.
         9) Work hours.
         10) Hazards and risks.
         11) Progress cleaning.
         12) Quality and work standards.
         13) Status of RFIs.
         14) Proposal Requests.
         15) Change Orders.
         16) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

AIA Document C106™ – 2013

Digital Data Licensing Agreement

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

BETWEEN the Party transmitting Digital Data ("Transmitting Party"):
(Name, address and contact information, including electronic addresses)

RDG IA Inc
dba RDG Planning and Design
301 Grand Avenue
Des Moines, IA 50309
Phone Number: 515.288.3141
Electronic Address: desmoines@rdgusa.com

and the Party receiving the Digital Data ("Receiving Party"):
(Name, address and contact information, including electronic addresses)

Company
Address
City-State-Zip
Phone Number: ???
Electronic Address: ???

For the following Project:
(Name and location or address)

Project name
Location

The Transmitting Party and Receiving Party agree as follows.

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 TRANSMISSION OF DIGITAL DATA

3 LICENSE CONDITIONS

4 LICENSING FEE OR OTHER COMPENSATION

5 DIGITAL DATA

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 The purpose of this Agreement is to grant a license from the Transmitting Party to the Receiving Party for the Receiving Party's use of Digital Data on the Project, and to set forth the license terms.

§ 1.2 This Agreement is the entire and integrated agreement between the parties. Except as specifically set forth herein, this Agreement does not create any other contractual relationship between the parties.

§ 1.3 For purposes of this Agreement, the term Digital Data is defined to include only those items identified in Article 5 below.

§ 1.3.1 Confidential Digital Data is defined as Digital Data containing confidential or business proprietary information that the Transmitting Party designates and clearly marks as "confidential."

ARTICLE 2 TRANSMISSION OF DIGITAL DATA

§ 2.1 The Transmitting Party grants to the Receiving Party a nonexclusive limited license to use the Digital Data identified in Article 5 solely and exclusively to perform services for, or construction of, the Project in accordance with the terms and conditions set forth in this Agreement.

§ 2.2 The transmission of Digital Data constitutes a warranty by the Transmitting Party to the Receiving Party that the Transmitting Party is the copyright owner of the Digital Data, or otherwise has permission to transmit the Digital Data to the Receiving Party for its use on the Project in accordance with the terms and conditions of this Agreement.

§ 2.3 If the Transmitting Party transmits Confidential Digital Data, the transmission of such Confidential Digital Data constitutes a warranty to the Receiving Party that the Transmitting Party is authorized to transmit the Confidential Digital Data. If the Receiving Party receives Confidential Digital Data, the Receiving Party shall keep the Confidential Digital Data strictly confidential and shall not disclose it to any other person or entity except as set forth in Section 2.3.1.

§ 2.3.1 The Receiving Party may disclose the Confidential Digital Data as required by law or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity. The Receiving Party may also disclose the Confidential Digital Data to its employees, consultants or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of Confidential Digital Data as set forth in this Agreement.

§ 2.4 The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights; nor does the Transmitting Party convey to the Receiving Party any right in the software used to generate the Digital Data.

§ 2.5 To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.

ARTICLE 3 LICENSE CONDITIONS

The parties agree to the following conditions on the limited license granted in Section 2.1:
(State below rights or restrictions applicable to the Receiving Party's use of the Digital Data, requirements for data format, transmission method or other conditions on data to be transmitted.)

§ 3.1 Digital Data contained in these electronic files at the time of transfer, are part of RDG's Instruments of Service, and RDG shall be deemed the author and owner of its Instruments of Service and shall retain all common law, statutory and other reserved rights, including copyrights.

§ 3.2 These electronic files are being provided to Receiving Party for informational purposes only and shall be used by Receiving Party, and anyone receiving them through Receiving Party, solely as a convenience in performing Work for this project. Any other use or reuse by Receiving Party or others is strictly prohibited except for the following:

§ 3.2.1 The Landscape Architectural Digital Data file, when transmitted, may be used for horizontal layout purposes and earthwork quantity take-off. Architectural and Engineering Digital Data files may not be used for this purpose.

§ 3.3 This Digital Data is not Contract Documents and therefore may not represent revisions made by addenda, construction phase changes, or subsequent changes after transmission. This data does not assure as-constructed conditions.

If differences or conflicts exist between digital data and hard-copy project or Contract Documents, the hard-copy project or Contract Documents and subsequent Contract Document changes shall govern.

§ 3.4 Use of this Digital Data does not relieve Receiving Party of its duty to fully comply with the Contract Documents.

§ 3.5 Digital Data may be shared by Receiving Party with other third parties for use on this project only under the same licenses conditions. Receiving Party may only share with full notice of these license conditions and separate third party license agreements.

§ 3.6 Use of this Digital Data is at the sole risk of the using Party and is without liability, risk or legal exposure to RDG.

§ 3.7 RDG makes no representation or warranty, either expressed or implied as to the Digital Data's accuracy or suitability for any specific purpose. Use of this Digital Data is at the sole risk of the using Party and is without liability, risk or legal exposure to RDG.

§ 3.8 Under no circumstances shall delivery of this Digital Data for use by Receiving Party be deemed a sale by Transmitting Party and Transmitting Party makes no warranties, either express or implied, of merchantability and fitness for any purpose.

ARTICLE 4 LICENSING FEE OR OTHER COMPENSATION

~~The Receiving Party agrees to pay the Transmitting Party the following fee or other compensation for the Receiving Party's use of the Digital Data:~~
~~*(State the fee, in dollars, or other method by which the Receiving Party will compensate the Transmitting Party for the Receiving Party's use of the Digital Data.)*~~

ARTICLE 5 DIGITAL DATA

The Parties agree that the following items constitute the Digital Data subject to the license granted in Section 2.1:
(Identify below, in detail, the information created or stored in digital form the parties intend to be subject to this Agreement.)

Digital Data Name	File Date	File Size	Software Version
File Name	???	??? KB	Autodesk Revit 2019

This Agreement is entered into as of the day and year first written above and will terminate upon Substantial Completion of the Project, as that term is defined in AIA Document A201™–2007, General Conditions of the Contract for Construction, unless otherwise agreed by the parties and set forth below.
(Indicate when this Agreement will terminate, if other than the date of Substantial Completion.)

NA

TRANSMITTING PARTY	RECEIVING PARTY
(Signature) ??? ??? *(Printed name and title)*	*(Signature)* ??? ??? *(Printed name and title)*

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Site condition reports.
   3. Unusual event reports.

1.2 SUBMITTAL PROCEDURES

A. Prepare construction schedules, site condition reports, and special reports as PDF electronic files and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.

1.3 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Indicate start and completion dates for the following as applicable:
      a. Securing of approvals and permits required for performance of the Work.
      b. Temporary facilities.
      c. Construction of mock-ups, prototypes and samples.
      d. Owner interfaces and furnishing of items.
      e. Regulatory agency approvals.
      f. Contractor’s punch list.
      g. Owner’s/Architect’s punch list.
   3. Long Lead-Time Procurement Activities: Include procurement process activities for major items requiring a cycle of more than 60 days as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
   5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Mock-ups: Indicate dates for completion of all mock-ups and the review time to obtain approval. Do not begin work represented by the mock-up until the mock-up is approved. List as part of the critical path for the work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
1. Structural completion.
2. Temporary enclosure and space conditioning.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.5 GANTT-CHART SCHEDULE REQUIREMENTS

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule.

C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
   3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   4. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   5. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   6. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   7. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   8. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with construction schedule. Include submittals required during the first 30 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Submittal Category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Architect's final release or approval.
g. Scheduled dates for purchasing.
h. Scheduled date of fabrication.
i. Scheduled dates for installation.
j. Activity or event number.

1.4 SUBMITTAL FORMAT

A. Submittal Information: Include the following information in each submittal:
1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF document, incorporating complete information into each PDF file. Name PDF file with submittal number.
1. PDF Documentation Format: Unrestricted, searchable, read-only, Portable Document Format (PDF) that allows printing, copying or extracting content, and the addition of markups using Adobe Acrobat, Bluebeam Revu, or similar PDF reading and editing software.
2. Electronically convert paper documents using Optical Character Recognition (OCR) software if needed to comply with specified documentation format properties.
3. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
4. Name file with submittal number or other unique identifier, including revision identifier.
a. File name shall use Specification Section number followed by a dash and then a sequential number (e.g., 061000-001).
b. Resubmittals shall include an alphabetic suffix (e.g., 061000-001a).

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Web-Based Project Software: Prepare submittals in PDF form, and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.
      a. No fee or special software other than internet access is required for access to or use of web-based software website.
      b. Specific access instructions will be provided following Award of Contract.

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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on 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.

D. 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 with approval notation from Architect's action stamp.

E. 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.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. 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 published data are unsuitable 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 catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams that show factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Do not submit Safety Data Sheets (SDS) with submittal. Safety Data Sheets included with submittal documents will not be reviewed by Architect.
6. Submit Product Data before or concurrent with Samples.

B. 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
   a. Project name and submittal number.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Drawing designation or Specification paragraph number and generic name of each item.
3. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
   a. Submit separate paper copy of transmittal and physical Samples to Architect.
4. 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.
5. 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.

6. 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 one Sample set; remainder will be returned. Retain one returned Sample set as a project record Sample.
        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.

D. Product Schedule: 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 indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

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

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
1. Certificates and Certifications Submittals: Submit a 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. Provide a notarized signature where indicated.
2. Installer Certificates: Submit 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.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit 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.
2. Field Test Reports: Submit written reports 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.
3. Material Test Reports: Submit 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.
4. Preconstruction Test Reports: Submit 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.
5. Product Test Reports: Submit written reports indicating that 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.
6. Research Reports: Submit 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:
    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
    1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
    1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
   1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

B. Informational Submittals: Architect's responsive action is not required; noncompliant submittals will be returned.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents or received from sources other than Contractor may be returned without review or discarded at Architect’s discretion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual 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 Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
      a. Include each system, assembly, component, and part of the exterior wall to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.
   2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction 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 Architect for a decision before proceeding.

1.5 SUBMITTAL PROCEDURES

A. Prepare submittals and reports as PDF electronic files and upload to Architect's web-based Project software website specifically established for project. Enter required data in web-based software site to fully identify submittal.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.
   1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
   2. Indicate manufacturer and model number of individual components.
   3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports and documents as specified.

D. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, telephone number, and email address of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, telephone number, and email address of technical 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.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, telephone number, and email address of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according

to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
   1. Provide test specimens representative of proposed products and construction.
   2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   4. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   5. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   6. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
   7. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups of size indicated.
   2. Build mockups in location indicated or, if not indicated, as directed by Architect.
   3. Notify Architect 14 days in advance of dates and times when mockups will be constructed. Coordinate date and time of mockup reviews to coincide with Project progress meetings.
   4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
   5. Demonstrate the proposed range of aesthetic effects and workmanship.
   6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
   8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   10. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which

mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Field quality-control testing and field special inspection services specified are the Owner's responsibility. Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Engage a qualified testing agency to perform quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's

services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
   1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's

"Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.soundandcommunications.com.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.

44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.eciaonline.org.
76. EIA - Electronic Industries Alliance; (See TIA).
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
80. ESTA - Entertainment Services and Technology Association; (See PLASA).
81. ETL - Intertek (See Intertek); www.intertek.com.
82. EVO - Efficiency Valuation Organization; www.evo-world.org.
83. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmglobal.com.
87. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GANA - Glass Association of North America; (See NGA).
93. GS - Green Seal; www.greenseal.org.
94. HI - Hydraulic Institute; www.pumps.org.
95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).

97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
98. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
99. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
100. IAS - International Accreditation Service; www.iasonline.org.
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
113. II - Infocomm International; (See AVIXA).
114. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
119. ISO - International Organization for Standardization; www.iso.org.
120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
121. ITU - International Telecommunication Union; www.itu.int/home.
122. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
123. LMA - Laminating Materials Association; (See CPA).
124. LPI - Lightning Protection Institute; www.lightning.org.
125. MBMA - Metal Building Manufacturers Association; www.mbma.com.
126. MCA - Metal Construction Association; www.metalconstruction.org.
127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
129. MHIA - Material Handling Industry of America; www.mhia.org.
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
132. MPI - Master Painters Institute; www.paintinfo.com.
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
136. NADCA - National Air Duct Cleaners Association; www.nadca.com.
137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
138. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
140. NBI - New Buildings Institute; www.newbuildings.org.
141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
142. NCMA - National Concrete Masonry Association; www.ncma.org.
143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
144. NECA - National Electrical Contractors Association; www.necanet.org.
145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
146. NEMA - National Electrical Manufacturers Association; www.nema.org.
147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
148. NFHS - National Federation of State High School Associations; www.nfhs.org.

149. NFPA - National Fire Protection Association; www.nfpa.org.
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; www.nfrc.org.
152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
153. NHLA - National Hardwood Lumber Association; www.nhla.com.
154. NLGA - National Lumber Grades Authority; www.nlga.org.
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
157. NRCA - National Roofing Contractors Association; www.nrca.net.
158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
159. NSF - NSF International; www.nsf.org.
160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
161. NSPE - National Society of Professional Engineers; www.nspe.org.
162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
164. NWFA - National Wood Flooring Association; www.nwfa.org.
165. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
166. PDI - Plumbing & Drainage Institute; www.pdionline.org.
167. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
168. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
169. RFCI - Resilient Floor Covering Institute; www.rfci.com.
170. RIS - Redwood Inspection Service; www.redwoodinspection.com.
171. SAE - SAE International; www.sae.org.
172. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
173. SDI - Steel Deck Institute; www.sdi.org.
174. SDI - Steel Door Institute; www.steeldoor.org.
175. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
176. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
177. SIA - Security Industry Association; www.siaonline.org.
178. SJI - Steel Joist Institute; www.steeljoist.org.
179. SMA - Screen Manufacturers Association; www.smainfo.org.
180. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
181. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
182. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
183. SPIB - Southern Pine Inspection Bureau; www.spib.org.
184. SPRI - Single Ply Roofing Industry; www.spri.org.
185. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
186. SSINA - Specialty Steel Industry of North America; www.ssina.com.
187. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
188. STI - Steel Tank Institute; www.steeltank.com.
189. SWI - Steel Window Institute; www.steelwindows.com.
190. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
191. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
192. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
193. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
194. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
195. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
196. TMS - The Masonry Society; www.masonrysociety.org.
197. TPI - Truss Plate Institute; www.tpinst.org.
198. TPI - Turfgrass Producers International; www.turfgrasssod.org.
199. TRI - Tile Roofing Institute; www.tileroofing.org.

200. UL - Underwriters Laboratories Inc.; www.ul.com.
201. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
202. USAV - USA Volleyball; www.usavolleyball.org.
203. USGBC - U.S. Green Building Council; www.usgbc.org.
204. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
205. WA - Wallcoverings Association; www.wallcoverings.org.
206. WASTEC - Waste Equipment Technology Association; www.wastec.org.
207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
209. WDMA - Window & Door Manufacturers Association; www.wdma.com.
210. WI - Woodwork Institute; www.wicnet.org.
211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.

3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E 84 and passing NFPA 701 Test Method 2.

C. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Not required.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of electrical-resistance heaters, gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

G. Telephone Service: Not required; provide superintendent with cellular telephone.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Project site for temporary parking areas for construction personnel.

D. Storage and Staging: Use designated areas of Project site for storage and staging needs.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Temporary Signs: Provide signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touch up signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings or requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard and replace stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 57 14 – EROSION AND SEDIMENT CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. REFERENCED SPECIFICATIONS:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. Division 9:
         1) Section 9040 – Erosion and Sediment Control
            a) Revised 2022 Edition
      b. Division 9:
         1) Section 11050 – Concrete Washout
            a) Revised 2022 Edition

1.2 SUMMARY

A. For construction of items covered by this section, utilize all provisions of the referenced specifications except:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. For all Sections:
         1) Part 1.08 Measurement and Payment: No measurement or unit prices will be utilized for this area of work.
   2. As explicitly noted or specified within the Contract Documents.

1.3 SUBMITTALS

A. Comply with SUDAS 9040, Part 1.3.

PART 2 - PRODUCTS

A. Comply with SUDAS 9040, as applicable.

B. Concrete washouts shall comply with SUDAS 11050, Part 2.01.A, 1 or 3.

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 01 23 00 "Alternates" for products selected under an alternate.
   2. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
   3. Section 01 42 00 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
   1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product or substitution request, if applicable.

D. Comparable Product Submittal: An action submittal requesting consideration of a comparable product. Comply with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures" that demonstrates compliance with requirements.

F. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Resolution of Compatibility Disputes between Multiple Contractors:
      a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
      b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
   1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
      a. Name of product and manufacturer.
      b. Model and serial number.
      c. Capacity.
      d. Speed.
      e. Ratings.
   3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Provide a secure location and enclosure at Project site for storage of materials and equipment.

2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect; whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements.
    a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
    a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
    a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"
4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
    a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
    1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
    2. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
    3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
    4. Evidence that proposed product provides specified warranty.

5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation.
1. Submittal Procedures: Comply with Section 01 33 00 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements:
1. Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements in individual Specification Sections.
2. When approved in advance by Architect, other submittal requirements specified in individual Specification Sections may be combined with comparable product submittal. Approval by the Architect of comparable product submittal and of other submittal requirements will satisfy product’s submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Repair of the Work.
   8. Protection of installed construction.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for limits on use of Project site.
   2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
   3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 DEFINITIONS

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

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
   1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching 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 provide a match acceptable to Architect for the visual and functional performance of in-place materials.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.
   5. Check the location, level and plumb, of every major element as the Work progresses.
   6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, 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. Temporary Support: Provide temporary support of work to be cut.

C. 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.
   4. Submit testing, adjusting, and balancing records.
   5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   3. Complete startup and testing of systems and equipment.
   4. Complete repair and restoration operations required by Section 01 73 00 "Execution".
   5. Perform preventive maintenance on equipment used prior to Substantial Completion.
   6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
   7. Advise Owner of changeover in utility services.
   8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
   9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   10. Complete final cleaning requirements.
   11. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
   2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   3. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   4. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine final completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.
4. Submit list of incomplete items in the following format:
    a. PDF Electronic File: Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties prior to requesting final inspection.

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

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit on digital media acceptable to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Systems and equipment operation manuals.
   2. Systems and equipment maintenance manuals.
   3. Product maintenance manuals.

B. Related Requirements:
   1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

C. Initial Manual Submittal: Submit draft copy of each manual at least 45 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
   1. Correct or revise each manual to comply with Architect's comments.

D. Final Manual Submittal: Submit each manual in final form to Owner at least 15 days before commencing demonstration and training.

E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

a. Documentation Format: Unrestricted, searchable, read-only, Portable Document Format (PDF) that allows printing, copying or extracting content, and the addition of markups using Adobe Acrobat, Bluebeam Revu, or similar PDF reading and editing software.
b. Electronically convert paper documents using Optical Character Recognition (OCR) software if needed to comply with specified documentation format properties.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of maintenance manuals.

1.8 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
   2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one full-size set of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.

i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

1.6 MISCELLANEOUS RECORD SUBMITTALS

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

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.

d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Systems and equipment operation manuals.
   c. Systems and equipment maintenance manuals.
   d. Product maintenance manuals.
   e. Project Record Documents.
   f. Identification systems.
   g. Warranties and bonds.
   h. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish an instructor to describe Owner's operational philosophy.
   2. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 79 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls/grade beams.
   3. Slabs-on-grade.
   4. Concrete toppings.

B. Related Sections:
   1. Division 31 Section "Excavation and Backfill" for drainage fill under slabs-on-grade.
   2. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Fiber reinforcement.
   6. Waterstops.
   7. Curing compounds.
   8. Floor and slab treatments.
   9. Bonding agents.
   10. Adhesives.
   11. Vapor retarders.
   12. Semirigid joint filler.
   13. Joint-filler strips.
   14. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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-1 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.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete,"
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Preinstallation Conference:
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.
      e. Special concrete finish subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c. Structural 1, B-B or better; mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 82/A 82M.

E. Deformed-Steel Wire: ASTM A 496/A 496M.

F. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I
   a. Fly Ash: ASTM C 618, Class F
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. 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].
1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
   b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
   c. Euclid Chemical Company (The), an RPM company
   d. Grace Construction Products, W. R. Grace & Co.; DCI.
   e. Sika Corporation; Sika CNI.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Manufacturers:
   a. Greenstreak.
   b. Williams Products, Inc.

B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
   1. Manufacturers:
      a. BoMetals, Inc.
      b. Greenstreak.
      c. Paul Murphy Plastics Company.
      d. Vinylex Corp.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum perm rating of 0.04. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
      b. Fortifiber Building Systems Group; Moistop Ultra 15.
      c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
      d. Insulation Solutions, Inc.; Viper VaporCheck 16.
      e. Meadows, W. R., Inc.; Perminator 15 mil.
      f. Raven Industries Inc.; Vapor Block 15.
      g. Reef Industries, Inc.; Griffolyn Type-105.
      h. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. 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.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
      b. BASF Construction Chemicals - Building Systems; Confilm.
      c. ChemMasters; SprayFilm.
      d. Conspec by Dayton Superior; Aquafilm.
      e. Dayton Superior Corporation; Sure Film (J-74).
      f. Edoco by Dayton Superior; BurkeFilm.
      g. Euclid Chemical Company (The), an RPM company; Eucobar.
      h. Kaufman Products, Inc.; Vapor-Aid.
      i. Lambert Corporation; LAMBCO Skin.
      j. L&M Construction Chemicals, Inc.; E-CON.
      k. Meadows, W. R., Inc.; EVAPRE.
      l. Metalcrete Industries; Waterhold.
      m. Nox-Crete Products Group; MONOFILM.
      n. Sika Corporation; SikaFilm.
      o. SpecChem, LLC; Spec Film.
      p. Symons by Dayton Superior; Finishing Aid.
      q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.

r. Unitex; PRO-FILM.
s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products:
a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber]

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:]
1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture,plus or minus 1 inch.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 470 lb/cu. yd..
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

C. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.; place sheets in position with longest dimension parallel with direction of pour.
   1. Level and compact base material.
   2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments (such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier). At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
   3. Lap joints 6 inches and seal with manufacturer's recommended tape.
   4. Apply seam tape to a clean and dry vapor barrier.

5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. Avoid the use of non-permanent stakes driven through vapor retarder.
7. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
8. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

A. General: Construct 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.
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. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
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. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed 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 written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. 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.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6

inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
   3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate or aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by 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 at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in 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. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated 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 curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
   4. Product:
      a. Basis of Design Product: “Euco Diamond Hard” by The Euclid Chemical Co. www.euclidchemical.com

B. Sealing Coat: Uniformly apply a continuous sealing coat to hardened concrete by power spray or roller according to manufacturer's written instructions.
   1. Product:
      a. Basis of Design Product: “Euclid Chemical Company (The), and RPM Company, UltraGuard. www.euclidchemical.com

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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 bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.
   3. Headed bolts and studs.
   4. Verification of use of required design mixture.
   5. Concrete placement, including conveying and depositing.
   6. Curing procedures and maintenance of curing temperature.
   7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   7. Compression Test Specimens: ASTM C 31/C 31M.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
   8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concrete masonry units (CMU's).
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
1. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

C. Samples:
1. Colored CMU: Full size samples of each color.
2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:
1. Masonry units.
   a. Include data on material properties.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.
   1. Density Classification: Normal weight unless otherwise indicated.
   2. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   3. CMU with Exterior Exposure: Provide units and mortar made with integral water repellent and integral color.
      a. Basis of Design: Oldcastle Echelon Standard Masonry – Smooth Face.
      b. Pattern and Texture:
         1) Standard pattern, smooth-face finish.
      c. Color: Ironwood**.**

C. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207, Type S.

C. Aggregate for Mortar: ASTM C144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.

D. Aggregate for Grout: ASTM C404.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979. Use only pigments with a record of satisfactory performance in masonry mortar.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Euclid Chemical Company (The); an RPM company.
b. GCP Applied Technologies Inc.

H. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.
1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane.

B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.7 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Anchor Bolts: Headed steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153/A153M, Class C; of dimensions indicated.

2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For reinforced masonry, use Type S.
   2. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
   1. Color(s): As selected by Architect from manufacturer's full color line.
   2. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Integrally colored CMUs.

E. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent

construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 04 22 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural steel.

B. Related Sections:

1. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.

1.2 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360, 14th Edition.
2. Use ASD; data are given at service-load level, UNO.

B. Moment Connections: Type FR, fully restrained, UNO.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and Fabricator.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who can demonstrate a minimum of 5 years of comparable experience.

B. Installer Qualifications: A qualified installer who can demonstrate a minimum of 5 years of comparable experience.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Preinstallation Conference: Conduct conference at Project site or by telephone. A representative from the General Contractor, Erector, Fabricator, Detailer, Architect and Engineer are required to be in attendance.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. W-Shapes: ASTM A 992.

C. Channels, Angles: ASTM A 36.

D. Plate and Bar: ASTM A 36, except stiffeners in moment connections shall be ASTM A572, Grade 50.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F 1554, Grade 36, UNO.

1. Configuration: Straight.
2. Finish: Plain

G. Headed Anchor Rods: ASTM F 1554, Grade 36, UNO straight.

1. Finish: Plain.

H. Threaded Rods: ASTM A 36, UNO.

1. Finish: Plain.

I. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

J. Cables: ASTM A416, Grade 270, UNO
1. Finish: galvanized
2. Size: as indicated

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: Comply with Division 09 painting Sections and Division 09 Section High-Performance Coatings.

C. Primer: SSPC-Paint 25, Type I, UNO zinc oxide, alkyd, linseed oil primer.

D. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360, 14th Edition.

B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 (Group A) or A 490 Bolts (Group B)" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, UNO.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, UNO.

B. Weld Connections: Comply with AWS D1.1 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.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 05 12 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Metal bollards.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.
6. Metal gates for dumpster enclosure.

B. Products furnished, but not installed, under this Section:
1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:
1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 05 51 00 “Metal Stairs.”
3. Section 05 52 00 "Metal Railings."

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
1. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A 36M.

C. Steel Tubing: ASTM A500, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and fasteners hot-dip galvanized to ASTM A153/A153M at exterior walls and high humidity interior locations. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
   1. Hot-dip galvanized zinc coating where item being fastened is indicated to be galvanized or pressure-preservative treated wood.

E. Eyebolts: ASTM A489.

F. Machine Screws: ASME B18.6.3.

G. Lag Screws: ASME B18.2.1.

H. Plain Washers: Round, ASME B18.22.1.

I. Lock Washers: Helical, spring type, ASME B18.21.1.

J. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

K. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A 47M malleable iron or ASTM

A27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Section 09 91 00 “Paints and Coatings."

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 METAL ENCLOSURE GATES AND SCREENS

A. Gate Configuration: As indicated on Drawings.

B. Metal Gate Frame and Posts Finish: Hot-dipped galvanized after fabrication and HPC finish.

C. Metal Infill Panels: 1/8-inch aluminum plate, HPC finish.

D. Hardware: Finish to match gates.
   1. Hinges: 5/8-inch diameter x 5-inch-high stainless-steel pin, ball-bearing hinge with grease fitting; equivalent to Barnett Bates Barrel Hinge.
   2. Provide keepers for each gate leaf more than 5 feet wide.
   3. Center Gate Stop: Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking.

E. Cane Bolts: Fabricate from 3/4-inch- diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 hot-dip galvanized steel pipe.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize loose steel bearing and leveling plates located in exterior walls.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

B. Galvanize steel angles located in exterior walls.

2.12 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A 153M for steel and iron hardware and with ASTM A123/A 123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive High-Performance Coatings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 REPAIRS

A. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
      a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 05 50 00

SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preassembled steel stairs with concrete-filled treads.
   2. Metal railings and guards attached to metal stairs.
   3. Steel handrails attached to walls adjacent to metal stairs.

B. Related Sections:
   1. Section 03 30 00 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs, railings, and guards.
   1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
   2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
   1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:
   1. Shop primer products.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
   3. Include plan at each level.
   4. Indicate locations of anchors, weld plates, and blocking for attachment of metal railings and guards.

C. Samples: For the following products, in manufacturer's standard sizes:
   1. Grating treads.

D. Delegated-Design Submittal: For stairs, railings and guards, , including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs, railings and guards, including attachment to building construction.
   1. Member size where shown on Drawings is a minimum. Final engineering and determination of member sizes is the responsibility of the Delegated-Design engineer.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Uniform Load: 100 lbf/sq. ft.
   2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.
   3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
      a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 FERROUS METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500 (cold formed) or ASTM A513, Type 5 (mandrel drawn).

D. Rolled-Steel Floor Plate: ASTM A786/A 786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

E. Cast Iron: Either gray iron, ASTM A48/A 48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

F. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

G. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 33, with G90 coating.

H. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

I. Steel Wire Rod for Grating Crossbars: ASTM A510/A510M.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide zinc-coated fasteners hot-dip galvanized to ASTM A153 for fasteners built into exterior walls.
   1. Select fasteners for type, grade, and class required.
   2. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
   1. Hot-dip galvanize zinc coating where item being fastened is indicated to be galvanized.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

D. Machine Screws: ASME B18.6.3.

E. Lag Screws: ASME B18.2.1.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 12, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 09 91 00 “Paints and Coatings,”

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior and exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

F. Concrete-Filled Tread:
   1. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inchunless otherwise indicated.
   2. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, galvanized steel, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated on Drawings.
   3. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening welded-wire reinforcement in place.
   4. Manufacture bar supports from steel wire or plastic according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
   5. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.

B. Assembled stairs in shop to greatest extent possible.
   1. Disassemble units only as necessary for shipping and handling limitations.
   2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Weld exposed corners and seams continuously unless otherwise indicated.
   5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
   1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
   2. Locate joints where least conspicuous.

3. Fabricate joints that will be exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate.

2.6 FABRICATION OF STEEL-FRAMED STAIRS AND PLATFORMS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Service Class, unless more stringent requirements are indicated.

B. Stair and Platform Framing:
1. Fabricate stringers and platforms of steel framing members indicated, size as required to comply with "Performance Requirements" Article.
2. Provide closures for exposed ends of channel and rectangular tube framing.
3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
5. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
   a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
6. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
7. Galvanize steel framing and supports in the following locations:
   a. Exterior.
   b. Interior, where indicated.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.
2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding.
3. Shape metal pans to include nosing integral with riser.
4. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

D. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.
1. Fabricate to dimensions and details indicated.

2.7 STAIR RAILINGS

A. Comply with applicable requirements in Section 05 52 00 "Metal Railings’.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
   1. Interior Stairs Indicated to Receive High-Performance Coatings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
   1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Placement: Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
   1. Exterior Galvanized Stairs: Provide bolted connections; field welding is not permitted.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
   2. Comply with requirements for welding in "Fabrication, General" Article.
   3. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-in-Place Concrete."

3.3 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonmetallic, nonshrink grout unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 05 51 00

SECTION 05 52 00 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel railings.
   2. Mezzanine safety gates.

1.2 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Handrail brackets.
   2. Shop primer.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.

1. Member size where shown on Drawings are a minimum. Final engineering and determination of member size is the responsibility of the Delegated-Design engineer.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
   1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL

A. Tubing: ASTM A500 (cold formed) or ASTM A513, Type 5 (mandrel drawn).

B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A29M, Grade 1010.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM B633 or ASTM F1941, Class Fe/Zn 25 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 09 91 00 "Paints and Coatings."

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
   1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

G. Mezzanine Safety Gate: Self-closing pallet gate fabricated from steel tubing; size as indicated on Drawings.
   1. Basis of Design: PS Doors; Model PLG-6084.
   2. Finish: Manufacturer’s standard baked enamel paint finish.

2.6 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
   1. Clearly mark units for reassembly and coordinated installation.
   2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water.
   1. Provide weep holes where water may accumulate.
   2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
1. As detailed.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
   2. Hot-dip galvanize interior steel where indicated, including hardware, after fabrication.
   3. Comply with ASTM A123/A123M for hot-dip galvanized railings.
   4. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
   5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.
   1. Fit exposed connections together to form tight, hairline joints.
   2. Install railings level, plumb, square, true to line, without distortion, warp, or rack.
   3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
   4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

C. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For aluminum railings, attach posts as indicated using fittings designed and engineered for this purpose.
2. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit stainless-steel sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 CLEANING AND REPAIR

A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

B. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   2. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05 52 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood products.
   2. Wood-preservative-treated lumber.
   3. Dimension lumber framing.
   4. Engineered wood products.
   5. Miscellaneous lumber.
   6. Plywood backing panels.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. SPIB: The Southern Pine Inspection Bureau.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:
   1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Engineered wood products.
   3. Power-driven fasteners.
   4. Post-installed anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
   3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:
   1. Boards: 15 percent.
   2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:
   1. UC1: Interior construction not in contact with ground or subject to moisture.
   2. UC2: Interior construction not in contact with ground but may be subject to moisture.
   3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions by Grade: Construction or No. 2 grade.
   1. Application: Interior partitions not indicated as load bearing.
   2. Species:
      a. Hem-fir (north); NLGA.
      b. Southern pine or mixed southern pine; SPIB.
      c. Spruce-pine-fir; NLGA.
      d. Hem-fir; WCLIB, or WWPA.
      e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

B. Load-Bearing Dimension Lumber Framing:
   1. Application: Exterior walls and interior load-bearing partitions, rafters, and joists.
   2. Grade: See Structural Drawings.
   3. Species: See Structural Drawings.

2.4 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Boise Cascade Corporation.
      b. Finnforest USA.
      c. Georgia-Pacific.
      d. Jager Building Systems Inc.
      e. Louisiana-Pacific Corporation.
      f. Pacific Woodtech Corporation.
      g. Roseburg Forest Products Co.
      h. Weyerhaeuser Company.
   2. Extreme Fiber Stress in Bending, Edgewise: As indicated on Structural Drawings.
   3. Modulus of Elasticity, Edgewise: As indicated on Structural Drawings.

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Louisiana-Pacific Corporation.
      b. Roseburg Forest Products Co.
      c. Weyerhaeuser Company.
   2. Extreme Fiber Stress in Bending, Edgewise: As indicated on Structural Drawings.
   3. Modulus of Elasticity, Edgewise: As indicated on Structural Drawings.

2.5 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Furring.
   4. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.7 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

G. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

2.8 METAL FRAMING ANCHORS

A. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Simpson Strong-Tie Co., Inc.
2. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufactured listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Materials: Unless otherwise indicated, fabricate from the following materials:
1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
a. Use for interior locations, dry and enclosed, unless otherwise indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:
   1. Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction; scribe and cope as needed. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Sheer Wall Panels: Install to comply with manufacturer’s written instructions.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.10.1, "Fastening Schedule," in ICC's 2018 International Building Code (IBC).

M. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.

N. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

D. Install wood nailers at parapet copings, at perimeters of roof, at roof membrane terminations and offsets, and around all roof openings and projections. Coordinate locations with roofing contractor.
   1. Height of nailers shall match surface level of roof insulation, unless otherwise indicated.

3.3 INSTALLATION OF WALL AND PARTITION FRAMING

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
   1. Provide continuous horizontal blocking at midheight of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
   1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal (89-mm actual) depth for openings 48 inches (1200 mm) and less in width, 6-inch nominal (140-mm actual) depth for openings 48 to 72 inches (1200 to 1800 mm) in width, 8-inch nominal (184-mm actual) depth for openings 72 to 120 inches (1800 to

3000 mm) in width, and not less than 10-inch nominal (235-mm actual) depth for openings 10 to 12 feet (3 to 3.6 m) in width.

2. For load-bearing walls, see Structural Drawings.

END OF SECTION 06 10 00

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall sheathing.
   2. Composite nail base insulated roof sheathing.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Wall sheathing.
   2. Roof sheathing.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. Plywood Sheathing, Walls: DOC PS 1, Exterior sheathing.

B. Oriented-Strand-Board Sheathing, Walls: DOC PS 2, Exposure 1 sheathing.

2.3 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Vented, Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C1289, Type II, Class 1, Grade 2, with DOC PS 2, Exposure 1 oriented strand board adhered to spacers on one face.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Atlas Roofing Corporation, CrossVent.
      b. Cornell Performance Building Products, a Subsidiary of GAF; ThermaCal1.
      c. Hunter Panels; a Carlisle company; Cool-Vent.
   2. Total LTTR R-Value: 30 (minimum).
   3. Oriented-Strand-Board Nominal Thickness: 5/8 inch (15.9 mm).

4. Spacers: Wood furring strips or blocks not less than 1 inch (25.4 mm) thick and spaced not more than 12 inches (300 mm) o.c.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For roof and wall sheathing attaching to wood-preservative-treated or fire-retardant-treated wood framing, provide fasteners of Type 304 stainless steel.
   2. For roof and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours in accordance with ASTM B117.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall, parapet, and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Screw to wood framing.
      b. Screw to cold-formed metal framing.
      c. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior trim.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples: For each exposed product and for each color and texture specified.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
   1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
   2. Provide for air circulation around stacks and under coverings.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

2.2 EXTERIOR TRIM

A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AZEK Building Products, Incorporated.
      b. Plasticlad, LLC.
      c. VERSATEX Building Products, LLC.
   2. Density: Not less than 31 lb./cu. ft. (500 kg/cu. m).
   3. Heat Deflection Temperature: Not less than 130 degrees F (54 degrees C), in accordance with ASTM D648.
   4. Coefficient of Thermal Expansion: Not more than 4.5 x 10(-5) inches/inch x degrees F (8.1 x 10(-5) mm/mm x degrees C).
   5. Water Absorption: Not more than 1 percent, in accordance with ASTM D570.
   6. Flame-Spread Index: 75 or less, in accordance with ASTM E84.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
   1. Provide stainless steel fasteners.

B. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.

C. Vent Strips: Cor-A-Vent S-400 Strip Vent or approved equivalent.

D. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

E. Sealants: Silicone sealant in compliance with requirements in Section 07 92 00 "Joint Sealants," and recommended by sealant and substrate manufacturers for intended application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
   1. Use concealed shims where necessary for alignment.
   2. Scribe and cut exterior finish carpentry to fit adjoining work.
   3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
   4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
   5. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 INSTALLATION OF STANDING AND RUNNING TRIM

A. Install cellular PVC trim to comply with manufacturer's written instructions.

B. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
   1. Use scarf joints for end-to-end joints.
   2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water.
   1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements.
   1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 20 13

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced casework.
   2. Plastic-laminate-faced countertops.

B. Related Requirements:
   1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded casework.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, finishes, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, electrical switches and outlets, and other items installed in architectural woodwork.

C. Samples for Verification:
   1. Plastic laminates.
   2. PVC edge material.
   3. Thermoset decorative panels.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and

90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grade of interior architectural woodwork fabrication, finish, installation, and other requirements.
   1. Grade: Custom.

2.2 MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Moisture-Resistant Medium-Density Fiberboard: ANSI A208.2, Grade 155 MR50, made with binder containing no urea formaldehyde.
   2. Moisture-Resistant Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

C. Thermoset Decorative Panels: Medium-density fiberboard made with binder containing no urea formaldehyde finished with thermally fused, melamine-impregnated decorative paper complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
   1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
      a. Abet Laminati, Inc.
      b. Arborite; Wilsonart LLC.
      c. Formica Corporation.
      d. Lamin-Art, Inc.
      e. Nevamar; Panolam Industries International Inc.
      f. Pionite; Panolam Industries International Inc.
      g. Wilsonart; Wilsonart LLC.
   2. Colors: As Scheduled on Drawings.

E. Edging Materials: PVC; solid, high impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.
   1. Colors: As selected by Architect.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."
   1. Cabinet hardware shall be of all metal construction, meeting or exceeding the ANSI/BHMA A156.9, Grade 1 “performance” and “permanent set” test requirements, unless otherwise indicated.

B. Frameless Concealed Hinges: Fully adjustable, concealed, heavy gauge metal construction; 200,000 open-close cycle tested, with hinge manufacturer’s lifetime material replacement guarantee.
   1. Swing: 170 degrees.
   2. Finish: Nickel plated.
   3. Door Operation: Self closing and fitted with silencer bumpers.
   4. Basis of Design Product: Blum Clip Top 170 Degree Concealed Hinge.

C. Wire Pulls: Back-mounted 10mm diameter; stainless steel, matt finish; Hafele Cat. No. 115.61.601.

D. Adjustable Shelf Standards and Brackets:
   1. Shelf Standards: Heavy-duty, 12 gage steel; anochrome finish. Model No. 87 ANO as manufactured by Knape & Vogt or approved equivalent.
   2. Shelf Bracket: Heavy-duty steel with single molded nylon cam lever; anochrome finish. Model No. 187LL ANO as manufactured by Knape & Vogt or approved equivalent.
      a. Screw attach shelf to shelf bracket with manufacturer’s standard anochrome steel clip.

E. Shelf Rests: Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall have 2 integral support pins, 5mm diameter, to interface pre-drilled holes and to prevent accidental rotation of support.
   1. Support shall automatically adapt to 3/4 inch or 1-inch thick shelving and provide non-tip feature for shelving.
   2. Support shall be capable of supporting an imposed vertical load of 300 pounds without failure.

F. Drawer Slides: Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
   1. Medium Duty Drawers: Grade 1HD-100
      a. Drawers 24 Inches Wide or Less: All ball-bearing, rail mount, hold-in detent, with a 100 lb per pair load rating and progressive movement; Accuride 7432 or approved equivalent.
   2. File Drawers and Heavy-Duty Drawers: Grade 1HD-200.
      a. Drawers Over 24 Inches to 42 inches Wide: All ball-bearing, rail/bracket mount, hold-in detent, with a 200 lb per pair load rating, and sequential movement; Accuride 3640 or approved equivalent.
   3. Finish: Clear zinc

G. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

H. Locks:
   1. Door Locks: BHMA A156.11, E07121; 5-pin keyway; capable of being keyed alike, keyed different, and/or master keyed.
   2. Drawer Locks: BHMA A156.11, E07041; 5-pin keyway; capable of being keyed alike, keyed different, and/or master keyed

I. Grommets for Cable Passage through Countertops: 3-inch diameter (nominal), molded-plastic grommets and matching plastic caps with slot for wire passage; Doug Mockett and Co. or approved equivalent.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
   2. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Aluminum Trim: Extruded accessories of profiles and dimensions indicated; concealed fasteners.
   1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
   2. Finish: Satin anodized.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 304, No. 4 finish.

C. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

E. Metal Support Brackets: Furniture grade, epoxy powder coated steel.
   1. Provide metal wall bracket supports for all counters without supporting base cabinets; 48 inches maximum spacing.

F. Sink/lavatory mounting hardware:
   1. Manufacturer’s standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.

G. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.6 PLASTIC-LAMINATE CASEWORK

A. Type of Construction: Frameless.

B. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

C. Panel Core Construction: Medium-density fiberboard made with exterior glue or particleboard made with exterior glue.
   1. Thickness: As indicated.

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces Other Than Tops: Grade HGS.
   2. Postformed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade VGS.
   4. Edges: PVC edge banding, matching laminate in color, pattern, and finish.
      a. Cabinet Body: 1mm PVC.
      b. Door and Drawer Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8-inch radius.

E. Materials for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
      a. Edges of Plastic-Laminate Shelves: PVC edge banding, 1 mm thick, matching laminate in color, pattern, and finish.
      b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
   2. Drawer Sides and Backs: Thermoset decorative panels.
   3. Drawer Bottoms: Thermoset decorative panels.

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

G. Shelves: Unless noted otherwise, adjustable and minimum 3/4-inch-thick up to 36-inch span; minimum 1-inch-thick for over 36 inches to 42 inch span; minimum 1-1/8 inch thick for over 42 inch span.

2.7 PLASTIC-LAMINATE COUNTERTOPS AND SILLS

A. High-Pressure Decorative Laminate Grade: HGS.

B. Edge Treatment: 3-mm PVC edging, color to match high-pressure decorative laminate color.

C. Core Material: Particleboard or medium-density fiberboard.

D. Core Material at Sinks: Medium-density fiberboard made with exterior glue or particleboard made with exterior glue.

E. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation.

E. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 surface-bearing-head type screws sized for 1-1/2 inch (minimum) penetration into wood framing, blocking, or hanging strips.

G. Countertops and Sills:
   1. Anchor tops securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   2. Anchor sills securely by adhering to substrate material.
   3. Field Jointing and Seaming: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
      a. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
      b. Solid Surfacing Material Seams: Align adjoining components and form seams to comply with manufacturer's written recommendations using adhesive in color to match top. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

H. Seal junctures of tops, sills, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic sheet paneling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Crane Composites, Inc.
      b. Glasteel.
      c. Marlite, Inc.
      d. Newcourt, Inc.
      e. Nudo.
      f. Parkland Plastics
   2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency in accordance with ASTM E84. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 200 or less.
      b. Smoke-Developed Index: 450 or less.
   3. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
   4. Surface Finish: Smooth.
   5. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
   1. Color: Match panels.

B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

C. Adhesive: As recommended by plastic paneling manufacturer.

D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches (300 mm) wide.
   1. Mark plumb lines on substrate at panel joint locations for accurate installation.
   2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board insulation.
   2. Polyisocyanurate foam-plastic board insulation.
   3. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

E. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

2.2 FOUNDATION INSULATION (FDTN INSUL)

A. Extruded Polystyrene Board Insulation: ASTM C578, Type IV, 25 psi (173 kPa) minimum compressive strength; unfaced.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DiversiFoam Products.
      b. DuPont de Nemours, Inc.

c. Kingspan Insulation LLC.
d. Owens Corning.
e. The Dow Chemical Company.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type I, Class 1 or 2, in compliance with Physical Properties Table 1 of ASTM C578, Type IV; tri-laminate faced with impermeable foil/kraft/foil facer on both faces.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. Atlas Roofing Corporation.

2.3 BOARD INSULATION (BD INSUL)

A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Atlas Polyiso Roof and Wall Insulation.
b. Carlisle Coatings & Waterproofing Inc.
c. DuPont de Nemours, Inc.
d. Elevate; Holcim Building Envelope.
e. Hunter Panels; a Carlisle company.
f. Johns Manville; a Berkshire Hathaway company.
g. Rmax, A Business Unit of Sika Corporation.
h. The Dow Chemical Company.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Thermal Resistance (ASTM C518 @ 75 Degrees F): R value of 6.5 per inch of thickness.
4. Compressive Strength: ASTM D 1621; Grade 2 (20 psi).
5. Water Vapor Transmission in Accordance with ASTM E 96: Less than 0.05 perms.
6. Water Absorption in accordance with ASTM C 209: Less than 0.05 percent by volume.
7. Board Thickness: As indicated on Drawings.
8. Board Edges: Square.

2.4 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced : ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. CertainTeed; SAINT-GOBAIN.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:
1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Miscellaneous Application Accessories:
1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
2. Crack Sealer: Closed-cell insulating foam in aerosol dispenser recommended in writing by insulation manufacturer for filling gaps in board insulation.

3. Detailing Foam Insulation for Voids: Urethane foam complying with AAMA 812, low expansion pressure suitable for filling insulation gaps and voids adjacent to openings to protect against water, air, and sound intrusion.
4. Tapes for Reflective Insulation and Barriers:
    a. Aluminum-foil tape for repairs or splicing material.
    b. Double-sided tape for adhering to metal framing or overlapping material.
    c. Reinforced-foil tape for sealing tears or cuts in sheet vapor barrier.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in accordance with manufacturer's written instructions.
    1. If not otherwise indicated, extend insulation a minimum of 42 inches (1068 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units in accordance with manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing in accordance with manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members in accordance with the following requirements:
    1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install unfaced blanket insulation over ceiling area in thickness indicated. Where partitions occur, extend insulation up either side of partition.
5. For wood-framed construction, install blankets in accordance with ASTM C1320 and as follows:
    a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.

3.6 INSTALLATION OF BOARD INSULATION

A. Install board insulation in accordance with manufacturer's written instructions per project applications and conditions.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Polyethylene vapor retarders.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Polyethylene vapor retarders.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D4397, 6-mil- (0.15-mm-) thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 07 27 15 - SELF-ADHERING SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Self-adhering air barrier.
   1. Self-adhering sheet air barrier, vapor permeable.

1.2 DEFINITIONS

A. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

B. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

C. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of sheet air barrier. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
   1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
   2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   3. Include details of interfaces with other materials that form part of air barrier.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed

to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested in accordance with ASTM E2357.

2.3 SELF-ADHERING SHEET AIR BARRIER

A. Self-Adhering Sheet Air Barrier, Vapor-Permeable: Self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing Inc.; Fire Resist 705VP.
      b. Dorken Systems Inc.; Status SA.
      c. GCP Applied Technologies Inc.; Perm-A-Barrier VPS.
      d. Henry, a Carlisle Company; BlueskinVP 160.
      e. Siplast; WALLcontrol Monolith VP Adhered AWB.
      f. Soprema; Sporaseal Stick VP.
      g. Tremco; ExoAir 210 AT.
      h. VaproShield LLC; WrapShield SA Self-Adhered.
      i. W. R. Meadows, Inc; Air-Shield SMP.
   2. Physical and Performance Properties:
      a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.
      b. Tensile Strength: Minimum 40 lb./in.; ASTM D882.
      c. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E96/E96M, Desiccant Method, Procedure A.
      d. Nail Sealability: Pass; ASTM D1970.
      e. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested in accordance with ASTM D4541.
      f. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
      g. UV Resistance: Can be exposed to sunlight for 180 days in accordance with manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

E. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

F. Bridge isolation joints, with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

3.3 INSTALLATION OF SELF-ADHERING SHEET AIR BARRIER

A. Install materials in accordance with in ASTM D6135 and air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
   1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and in accordance with ASTM D6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
   1. Apply sheets in a shingled manner to shed water.
   2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- (150-mm-) wide, transition strip.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
   1. Coordinate air-barrier installation with installation of base flashing to ensure continuity of air barrier with base flashing.

2. Install transition strip on base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

I. Connect and seal exterior wall air-barrier sheet continuously to exterior glazing and window systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
1. Install self-adhering stainless steel transition strip between incompatible materials to separate materials and maintain continuity of air barrier.

J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

K. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
1. Transition Strip: Roll firmly to enhance adhesion.

M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.

N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

O. Do not cover air barrier until it has been tested and inspected by testing agency.

P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 27 15

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous sheet metal fabrications.

B. Related Sections:
   1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
   3. Include identification of material, thickness, weight, and finish for each item and location in Project.
   4. Include details for forming, including profiles, shapes, seams, and dimensions.
   5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   6. Include details of termination points and assemblies.
   7. Include details of roof-penetration flashing.
   8. Include details of special conditions.
   9. Include details of connections to adjoining work.
   10. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.5 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
   1. Surface: Smooth, flat.
   2. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   3. Color: As selected by Architect from manufacturer's full range.
   4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Thermal Stability: ASTM D1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 deg F.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

2.5 SHEET METAL FABRICATIONS

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   2. 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.
   3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
   4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
   6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   7. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
   8. Do not use graphite pencils to mark metal surfaces.

B. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

C. Fabricate sheet metal fabrications to dimensions indicated on Drawings from the following materials:
   1. Metallic-Coated Steel Sheet: 0.028 inch thick, unless otherwise indicated.
   2. Fabricate metal edge flashing retainers and cleats from not less than 0.034-inch thick metallic-coated sheet steel.

D. Copings: Fabricate copings in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners and seal watertight.
   1. Coping Profile: As indicated on Drawings.
   2. Joint Style: Butt, with 12-inch- wide, concealed backup plate.

E. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

F. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

G. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
   1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   2. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of sealant.

3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
8. Install sealant tape where indicated.
9. Torch cutting of sheet metal flashing and trim is not permitted.
10. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Permanently isolate back side of sheet metal flashing and trim from contact with wood, ferrous metal, or cementitious construction.

C. Fastener Sizes: Use fasteners of sizes that will penetrate wood substrate not less than 3/4 inch for wood screws.

D. Seal joints as shown and as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
   a. Embed hooked flanges of joint members not less than 1 inch into sealant.
   b. Form joints to completely conceal sealant.
   c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   d. Adjust setting proportionately for installation at higher ambient temperatures.
      1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

D. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

E. Maintain in a clean condition during construction.

F. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 62 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes non-fire rated joint sealants for the following applications, including those specified by reference to this Section:
   1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Construction joints in cast-in-place concrete.
      b. Joints between metal panels.
      c. Joints between different materials listed above.
      d. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
      e. Control and expansion joints in ceilings and other overhead surfaces.
      f. Other joints as indicated.
   2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Perimeter joints between gypsum board partitions and ceilings and adjacent surfaces.
      d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      f. Other joints as indicated.
   3. Interior joints in the following horizontal traffic surfaces:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Other joints as indicated.

B. Related Sections include the following:
   1. Division 08 Section "Glazing" for glazing sealants.
   2. Division 09 Section "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Silicone Sealant Warranty Period: Twenty years from date of Substantial Completion.
   2. Non-silicone Sealant Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing

according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in Joint-Sealant Schedule at end of Part 3.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.

B. Joint Priming: Prime joint substrates, where recommended by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Perform field-adhesion testing in compliance with sealant manufacturer's requirements for warranty period indicated.
   1. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   2. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Single-Component, Nonsag, Neutral-Curing Non-Staining, Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
   1. Application: All exterior non-rated, non-traffic joints, unless otherwise specified.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Dowsil; 790 Silicone Building Sealant.
      b. Momentive Performance Materials Inc., GE; SCS9000 SilPruf NB.
      c. Tremco Incorporated; Spectrem 3.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
   1. Application: All interior non-rated, non-traffic joints, unless otherwise specified.
   2. Products:
      a. Master Builders Solutions; MasterSeal NP 1.
      b. Pecora Corporation; Dynatrol I-XL.

c. Sika Corporation, Inc.; Sikaflex-1a.
d. Tremco Incorporated; Dymonic.

C. Mildew-Resistant, Single-Component, Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Applications: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
2. Products: Subject to compliance with requirements, provide one of the following:
a. Dowsil; 786 Silicone Sealant.
b. Momentive Performance Materials Inc., GE; SCS1700 Sanitary.
c. Pecora Corporation; 898 NST.
d. Tremco Incorporated; Tremsil 200 Clear.

D. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.
1. Applications: Interior control, expansion, and isolation joints in horizontal traffic surfaces of concrete floors remaining exposed-to-view.
2. Products: Subject to compliance with requirements, provide one of the following:
a. Master Builders Solutions; MasterSeal NP 2.
b. Pecora Corporation; Dynatred.
c. Sika Corporation; Sikaflex-2c NS.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow-metal doors and frames.

B. Related Requirements:
   1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Hollow metal door and frame manufacturer is responsible for providing an unobstructed raceway in frame from specified electrical hardware components to connection point at top of frame.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, energy performance, fire-resistance ratings and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Energy Performance, Exterior Door and Frame Assemblies: Certify and label energy performance as follows:
   1. Thermal Transmittance (U-factor): U-factor for exterior door and frame assemblies of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 102 or ASTM C 1363.
   2. Air Infiltration: Air leakage for exterior door and frame assemblies of not more than 0.10 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ceco Door Products; Assa Abloy.
   2. Curries Company; Assa Abloy.
   3. Republic Doors and Frames.
   4. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.3 INTERIOR STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Face sheets fabricated from uncoated, cold-rolled steel sheet, unless metallic-coated sheet is indicated; minimum thickness of 0.042-inch.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Kraft-paper honeycomb, unless otherwise indicated.

f. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Frames:
   a. Materials: Uncoated, steel sheet, unless metallic-coated sheet is indicated; minimum thickness of 0.053 inch.
   b. Construction: Face welded.
3. Exposed Finish: Prime.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 unless otherwise indicated.
1. Provide minimum 0.167-inch (7 gage) steel or equivalent thread depth for hinges
2. Provide minimum 0.167-inch (7 gage) steel for floor closers and pivots.
3. Provide minimum 0.093-inch (12 gage) steel for lock front, closers and overhead hold-open/stop arms

2.4 EXTERIOR STEEL DOORS AND FRAMES

A. Construct exterior hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.
1. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053-inch, with minimum A60 coating.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Polyurethane, polystyrene, or steel stiffened with polyurethane insulation.
   f. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
2. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067-inch, with minimum A60 coating.
   b. Fabricate frames as true thermally-broken frames equivalent to Ceco Door Products Mercury Series Thermal Break Frames.
   c. Construction: Full profile welded.
3. Exposed Finish: Prime.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 unless otherwise indicated.
1. Provide minimum 0.167-inch (7 gage) steel or equivalent thread depth for hinges
2. Provide minimum 0.167-inch (7 gage) steel for floor closers and pivots.
3. Provide minimum 0.093-inch (12 gage) steel for lock front, closers, and overhead hold-open/stop arms

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. Provide steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B for anchors of frames fabricated from metallic-coated steel sheet.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with minimum A60 coating.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
   1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
   2. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
   3. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
   4. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Weld joints in top edges of doors flush, completely sealed and ground smooth.
   5. Glazed Lites: Factory cut openings in doors.
   6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
   2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
   3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
      b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

E. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
   4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer, unless otherwise indicated.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
   2. Comply with requirements in Division 09 Section “High Performance Coatings” for preparation and prime finishing of hollow metal doors and frames scheduled to receive a High Performance Coating (HPC) finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with SDI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
      a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
      b. Install frames with removable stops located on secure side of opening.
   2. Fire-Rated Openings: Install frames according to NFPA 80.
   3. Floor Anchors: Secure with postinstalled expansion anchors.
   4. Solidly pack mineral-fiber insulation inside frames.
   5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below.
   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch plus or minus 1/32 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch plus or minus 1/32 inch.
      e. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes sectional-door assemblies.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. For power-operated doors, include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

C. Samples: For units with factory-applied finishes.
   1. Include Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's warranty and finish warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Failure of components or operators before reaching required number of operation cycles.
      c. Faulty operation of hardware.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      e. Delamination of exterior or interior facing materials.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Provide sectional doors that comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: As indicated on Structural Drawings.
   2. Testing: In accordance with ASTM E330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.
   3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
      a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
      b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

C. Seismic Performance: Provide sectional doors that withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Seismic Design Criteria: As indicated on Structural Drawings.

2.3 STEEL SECTIONAL-DOOR ASSEMBLY

A. Steel Sectional Door: Provide IECC-compliant sectional door formed with hinged sections and fabricated so that finished door assembly is rigid and aligned with tight hairline joints; free of warp, twist, and deformation; and complies with requirements in DASMA 102.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Arm-R-Lite.
      b. C.H.I. Overhead Doors, Inc.
      c. Clopay Building Products.
      d. Overhead Door Corporation.
      e. Raynor.
      f. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate as indicated when tested according to ASTM E283 or DASMA 105.
   1. Air Infiltration at Perimeter (Floor, Jamb, or Head Seals): Maximum rate of 0.15 cfm/sq. ft. at 25 mph.
   2. Air Infiltration (Section Joints): None, when tested at 25 mph

D. U-Value: 0.210 Btu/sq. ft. x h x deg F.

E. Steel Door Sections: ASTM A653/A653M, zinc-coated (galvanized) steel sheet with G60 zinc coating.
   1. Door Section Thickness: 2 inches.

2. Section Faces:
    a. Thermal-Break Construction: Provide sections with continuous thermal-break construction separating the exterior and interior faces of door.
    b. Exterior Face: Fabricated from single sheets, not more than 24-inches high; with horizontal meeting edges rolled to continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove, weather- and pinch-resistant seals and reinforcing flange return.
        1) Steel Sheet Thickness: 0.040-inch- nominal coated thickness.
        2) Surface: Manufacturer's standard.
    c. Interior Face: Enclose insulation completely within steel exterior facing and interior facing material, with no exposed insulation. Provide the following interior-facing material:
        1) Zinc-Coated (Galvanized) Steel Sheet: With minimum nominal coated thickness of 0.022 inch.
3. End Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch nominal coated thickness and welded to door section.
4. Intermediate Stiles: Provide intermediate stiles formed from not less than 0.064-inch-thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
5. Section Reinforcing: Horizontal and diagonal reinforcement as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.
    a. Bottom Section: Reinforce section with a continuous aluminum channel or angle conforming to bottom-section profile and allowing installation of astragal (weatherseal).
    b. Hardware Locations: Provide reinforcement for hardware attachment.
6. Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard insulation of type indicated below:
    a. Foamed-in-Place Insulation: Polyurethane with R-value of 18.3, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load.

F. Track: Manufacturer's standard, galvanized-steel track system. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides.
1. Size: 3 inches.
2. Material: Galvanized steel, ASTM A653/A653M, minimum G60 zinc coating.
3. Track Reinforcement and Supports: Provide galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors.
4. Lift Type: As indicated on Drawings.

G. Windows: Configuration and height as indicated on Drawings; installed with glazing of the following type:
1. Insulating Glass: Manufacturer's standard 1/2-inch insulating glass.

H. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom top and jambs of door.

I. Exhaust Port: Manufacturer's standard, installed in bottom section of each sectional door.

J. Hardware: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless steel, or other corrosion-resistant fasteners, to suit door type.
1. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch nominal coated thickness at each end stile and at each intermediate stile, in accordance with manufacturer's written recommendations for door size.

a. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible.
b. Provide double-end hinges where required for doors more than 16 ft. wide unless otherwise recommended by door manufacturer in writing.

2. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Match roller-tire diameter to track width.
   a. Roller-Tire Material: Case-hardened steel.
3. Push/Pull Handles: Equip each door with galvanized-steel lifting handles on each side of door, finished to match door.

K. Locking Device:
1. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.

L. Counterbalance Mechanism:
1. Torsion Spring: Adjustable-tension torsion springs complying with requirements of DASMA 102 for number of operation cycles indicated, mounted on torsion shaft.
2. Cable Drums and Shaft for Doors: Cast-aluminum cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised.
   a. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
   b. Provide one additional midpoint bracket for shafts up to 16 ft. long and two additional brackets at one-third points to support shafts more than 16 ft. long unless closer spacing is recommended in writing by door manufacturer.
3. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
4. Cable Safety Device: Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if lifting cable breaks.
5. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
6. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

M. Electric Door Operator: Electric door operator assembly of size and capacity recommended by door manufacturer for door and operation cycles specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24 V ac or dc.
3. Safety: Listed in accordance with UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower.
4. Operator Type: Jackshaft, side mounted.
5. Motor: Reversible-type with controller (disconnect switch) for interior, clean, and dry motor exposure. Use adjustable motor-mounting bases for belt-driven operators.
   a. Motor Size: As required to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
   b. Electrical Characteristics:
      1) Phase: Single phase.
      2) Volts: 115 V.
6. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

7. Obstruction Detection: Automatic external entrapment protection consisting of automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
    a. Monitored Entrapment Protection: Photoelectric sensor designed to interface with door-operator control circuit to detect damage to or disconnection of sensor and complying with requirements in UL 325.
8. Control Station: Flush mounted, three-position (open, close, and stop) control.
    a. Operation: Push button.
    b. Interior-Mounted Unit: Full-guarded, surface-mounted, standard-duty, weatherproof-type, NEMA ICS 6, Type 4 enclosure.
    c. Features: Provide the following:
        1) Radio-control operation.
            a) Provide two push button remote controls per door operator.
9. Emergency Manual Operation: Push-up type designed so required force for door operation does not exceed 25 lbf.
10. Emergency Operation Disconnect Device: Hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
11. Motor Removal: Design operator so motor can be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

N. Metal Finish: Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
1. Baked-Enamel or Powder-Coat Finish:
    a. Apply manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
    c. Interior Finish: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:
1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 36 13

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum-framed entrance and storefront systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:
   1. Plans, elevations, sections, full-size details, and attachments to other work.
   2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   3. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
   4. Point-to-point wiring diagrams showing the following:
      a. Power requirements for each electrically operated door hardware.
      b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Verification: Actual sample of finished products for each type of exposed finish.
   1. Size: Manufacturers' standard size.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.3 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrance and storefront systems, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront system.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrance and storefront systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrance and storefront systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Adhesive or cohesive sealant failures.
      e. Water penetration through fixed glazing and framing areas.
      f. Failure of operating components.
   2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
      c. Cracking, peeling, or chipping.
   2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed entrance and storefront systems to withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of length of span of the framing member for lengths of up to 13 feet 6 inches (4.1 m) and to 1/240 of length of span of the framing member plus 1/4 inch (6.35 mm) for lengths greater than 13 feet 6 inches (4.1 m).

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

D. Structural: Test in accordance with ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

F. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
   a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.38 Btu/sq. ft. x h x degrees F (2.16 W/sq. m x K) as determined in accordance with NFRC 100.
   b. Entrance Doors: U-factor of not more than 0.77 Btu/sq. ft. x h x degrees F (4.37 W/sq. m x K) as determined in accordance with NFRC 100.
2. Air Leakage:
   a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E283.
   b. Entrance Doors:
      1) Pair of Doors: Air leakage of not more than 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
      2) Single Door: Air leakage of not more than 0.50 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation.
2. Kawneer Company, Inc.; Arconic Corporation.
3. Manko Window Systems, Inc.
4. OldCastle BuildingEnvelope (OBE).
5. Pittco Architectural Metals, Inc.
6. Tubelite Inc.
7. U.S. Aluminum; C.R. Laurence Co., Inc.; CRH Americas, Inc.
8. YKK AP America Inc.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Exterior Framing Construction: Thermally broken.

2. Interior Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Exterior Framing Glazing Plane: Front.
5. Interior Framing Glazing Plane: Center.
6. Finish: Clear anodic finish.
7. Fabrication Method: Field-fabricated stick system.
8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
9. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
1. Exterior Door Construction: 1-3/4-inch (44.5-mm) **overall thickness, with minimum** 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Interior Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
3. Door Design: As indicated.
   a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide nonremovable glazing stops on outside of door.
5. Finish: Match adjacent storefront framing finish.

F. Thermal Barriers: Fabricate aluminum framing, including receptor head, sill, and sub-sill members, with an integral, concealed, low-conductance thermal barrier system; located between exterior materials and members exposed on interior side; in a manner that eliminates direct metal-to-metal contact. Provide one of the following thermal barrier systems:
1. Dual-Thermal Struts: Glass-reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions.
2. Pour and Debridge Thermal Barrier: Integral structural two-part polyurethane thermal break; thermal barrier pocket of aluminum extrusion shall be abraded or lanced to create a mechanical lock. Subject to compliance with requirements, provide the following:
   a. Product: AZON USA, AZO-Abrader or Lancer; No substitutions are permitted.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
   1. Color: Match structural sealant.

2.6 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:
   1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM and prepare surfaces in accordance with applicable SSPC standard.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

D. Trim and Infill Panels: Aluminum, 0.125-inch-thickness; finish to match mullion sections where exposed.

E. Exposed-to-View Flashings: Aluminum, 0.063-inch-thick, minimum; finish to match mullion sections where exposed.

F. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A240/A240M, of type recommended by manufacturer.

G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

H. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

I. Rigid PVC filler.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   7. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At interior and exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
   3. Where aluminum will contact preservative treated wood members, separate aluminum from wood member with either 1/4-inch (minimum) polyethylene or nylon spacers or 15 mil polyethylene separation film.

H. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

I. Install continuous thermally-broken aluminum subsills below all aluminum storefront sill members including jamb if jamb is continuous to the bottom of the opening.
   1. Extend subsill completely beneath the opening and turn up behind and beside sill framing member to a form a watertight "pan."
   2. Install components plumb and true in alignment with established lines and grades, and without warp or rack. Drain subsill to the exterior with positive slope.
   3. Set subsill in full sealant bed to produce weathertight installation.
   4. Seal all corners and joints watertight.
   5. Do not seal drainage weep holes.
   6. Do not penetrate horizontal portion of subsill with fasteners.
   7. Turn up subsill at edges sufficiently to account for differential air pressure.
   8. Seal subsill to frame to prevent air infiltration to interior.

J. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

K. Install joint filler behind sealant as recommended by sealant manufacturer.

L. Install components plumb and true in alignment with established lines and grades.

M. Install entrance doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

N. Install glazing as specified in Section 08 80 00 "Glazing."

3.3 ERECTION TOLERANCES

A. Install aluminum-framed entrance and storefront systems to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).

b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

END OF SECTION 08 41 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Mechanical door hardware for the following:
      a. Swinging doors.
   2. Electrified door hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Details of electrified door hardware.

C. Other Action Submittals:
   1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
      a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
      b. Content: Include the following information:
         1) Identification number, location, hand, fire rating, size, and material of each door and frame.
         2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
         3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
         4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
   2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

D. Schedules shall be kept current with all changes to the project. If changes occur, project hardware schedules shall be maintained to reflect the changes as they are approved. Omitted items shall be deleted from openings, added and replaced items shall be included. Installation submittals shall be kept current as changes occur. Upon request, a complete updated hardware schedule shall be provided to the contractor. Supplemental submittals that include only the changed openings will not be acceptable.

E. Prior to final payment, provide a record copy of hardware schedules, including all revisions and updates. All openings shall be listed to reflect final installed configuration only.

1.3 QUALITY ASSURANCE

A. Supplier Qualifications: The hardware supplier shall be a corporate member in good standing of The Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is currently participating in DHI’s continuing education program (CEP).

B. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

C. Items of hardware not definitely specified herein but necessary for completion of the work shall be provided. Such items shall be of type and quality suitable to the service required and

comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required.

D. Include such nuances as strike type, strike lip length, raised barrel hinges, mounting brackets, blade stop spacers, special templates, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.

E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated. Provide positive latching and self-closing, regardless if specified in sets.

F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

H. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC/ANSI A117.1.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
   4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the leading edge of the door.

J. Keying Conference: Not required. Confirm with Owner at a regular jobsite meeting that keying is to match existing building system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver keys to Owner by registered mail, overnight package service, or hand delivered.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Manufacturers' standard warranty period.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated and named manufacturers' products.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hager Companies.
      b. IVES.
      c. McKinney.
      d. Stanley.
   2. Interior Door Hinges: Steel, 0.134 inch minimum thickness except as noted. Provide heavyweight 0.180 inch minimum thickness on doors wider than 3’0”.
   3. Exterior Door Hinges: Stainless steel, provide heavyweight 0.180 inch minimum thickness unless noted otherwise.
   4. Hinge Size: 4-1/2” x 4-1/2” unless noted otherwise.
   5. Hinge Options:
      a. Nonremovable Pins: Provide set screw in hinge barrel that when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors, outswinging lockable corridor doors and doors with access control components.
      b. Corners: Square.
   6. Provide quantity as follows unless otherwise indicated.
   7. For doors up to 60 inches in height, provide 1 pair hinges; for doors 60 inches to 90 inches in height, provide 1-1/2 pairs of hinges; for doors over 90 inches and up to 120 inches in height, provide 1 additional hinge for each 30 inches of height.

2.3 MECHANICAL LOCKS AND LATCHES

A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

B. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Schlage.

2.4 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Lock cylinders shall match existing locks in use by the facility.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SARGENT.

2.5 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
   1. Existing System:
      a. Master key or grand master key locks to Owner's existing system. Sargent Signature LA at exterior doors and Sargent conventional LA at interior doors.

B. Keys: Brass.
   1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
      a. Notation: Information to be furnished by Owner.
   2. Quantity: In addition to one extra key blank for each lock, provide the following:
      a. Cylinder Change Keys: Three.
      b. Master Keys: Five.
      c. Grand Master Keys: Five.
      d. Great-Grand Master Keys: Five.

2.6 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; cast iron, rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force. Provide extra-duty arms at parallel arm applications.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. LCN.
      b. SARGENT.

2.7 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass base metal.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Architectural Builders Hardware.
      b. Hager.
      c. IVES.
      d. Rockwood.
      e. Trimco.

2.8 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hager.
      b. National Guard Products.
      c. Pemko.
      d. Reese.
      e. Zero.

2.9 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hager.
      b. National Guard Products.
      c. Pemko.
      d. Reese.
      e. Zero.

2.10 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; four sides beveled, with manufacturer's standard machine or self-tapping screw countersunk fasteners.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hager.
      b. IVES.
      c. Rockwood.
      d. Trimco.

2.11 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Don-Jo.
      b. Hager.
      c. IVES.
      d. Rockwood.
      e. Trimco.

2.12 ELECTRIC STRIKES

A. Auxiliary Hardware: BHMA A156.31.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Folger Adams.
      b. HES.
      c. Von Duprin.

2.13 AUXILIARY ELECTRIFIED DOOR HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Altronix.
   2. GE Security.
   3. SARGENT.
   4. Schlage.
   5. Securitron.

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not

permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
   a. Wood or Machine Screws: For the following:
      1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
      2) Strike plates to frames.
      3) Closers to doors and frames.
   b. Steel Through Bolts: For the following unless door blocking is provided:
      1) Surface hinges to doors.
      2) Closers to doors and frames.
      3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

C. Install each door hardware item to comply with manufacturer's 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. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

E. Boxed Power Supplies: Locate power supplies within Breakroom area. Exact placement to be coordinated with Owner.
   1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
1. Provide solid blocking in the wall behind all wall mounted door stops.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

J. 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.

3.2 DOOR HARDWARE SCHEDULE

A. Hardware Sets are listed on Drawings Sheet A10.01. Primary Basis of Design Products are as follows:

HINGES	AS SPECIFIED	630	HAG
ELECTRIC STRIKE	1500C	630	HES
STOREROOM	L9080L 03A	626	SCH
PRIVACY W/INDICATOR	L9040 03A L283-722	626	SCH
CLASSROOM	L9070L 03A	626	SCH
CYLINDER	AS REQUIRED	626	SAR
CLOSER	4040XP SCUSH	689	LCN
KICK PLATE	10” X 2” LDW	630	ROC
THRESHOLD	425HD	719	NGP
SWEEP	200NA	628	NGP
WEATHERSTRIPPING	9700A	628	NGP
DRIP CAP	16A	628	NGP
DOOR POSITION SWITCH	DPS	BLK	SEC
CARD READER	BY SECURITY CONTRACTOR		
WALL STOP	400	626	ROC
GASKETING	5050	BLK	NGP

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass products.
   2. Insulating glass.
   3. Glazing sealants.
   4. Glazing tapes.
   5. Miscellaneous glazing materials.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.
   1. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.
   1. Design Wind Pressures: As indicated on Drawings.
   2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
   3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated or required by regulations of authorities having jurisdiction, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
   4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7 computer program.
   5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
   1. Minimum Glass Thickness: 6 mm.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cardinal Glass Industries.
   2. Guardian Industries.
   3. Oldcastle Glass.
   4. Viracon.
   5. Vitro Architectural Glass.

B. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
   1. Provide Kind FT (fully tempered) glass lites.
   2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
   3. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
   4. Spacer: Stainless steel or nonmetallic.
   5. Desiccant: Molecular sieve or silica gel, or a blend of both.

C. Low-E-Coated, Clear, Insulating-Glass Units:
   1. Basis of Design:
      a. Guardian Industries; SuperNeutral 68 Low-E.
      b. Viracon; VE1-2M Low-E Insulating Glass.
      c. Vitro Architectural Glass: Solarban 60 (2) Clear.
   2. Overall Unit Thickness: 25.4 mm.
   3. Outdoor Lite: Class 1 (clear) float glass.
   4. Interspace Content: Argon.
   5. Indoor Lite: Class 1 (clear) float glass.
   6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
   7. Visible Light Transmittance: 70 percent.
   8. Winter Nighttime U-Factor: 0.25.
   9. Summer Daytime U-Factor: 0.21.
   10. Solar Heat Gain Coefficient: 0.37.

2.6 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Immersible, neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Use NT, I.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DOWSIL.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. Tremco Incorporated.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
   1. EPDM, ASTM C 864.
   2. Silicone, ASTM C 1115.
   3. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
   1. EPDM.
   2. Silicone.
   3. Any material indicated above.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. 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 in writing by glass manufacturer.

END OF SECTION 08 80 00

SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvers.
   2. Blank-off panels for louvers

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
   2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Air Flow Company, Inc.
b. Airolite Company, LLC (The).
c. Architectural Louvers; Harray, LLC.
d. Construction Specialties, Inc.
e. Greenheck Fan Corporation.
f. Industrial Louvers, Inc.
g. NCA Manufacturing, Inc.
h. Reliable Products, Inc.
i. Ruskin Company.
j. United Enertech.
k. Anemostat-Arrow
2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Mullion Type: Exposed.
5. Louver Performance Ratings: As scheduled on Mechanical Drawings.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Same finish as louver frames to which louver screens are attached.
   3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
   1. Thickness: 2 inches.
   2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
   3. Insulating Core: Extruded-polystyrene foam.
   4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
   5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
   6. Panel Finish: Same finish applied to louvers.

2.6 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.
   1. Use Phillips flat-head hex-head or Phillips pan-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
   2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
   3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E488/E488M conducted by a qualified testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.7 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
   2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
   1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As Scheduled on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Sections include the following:
   1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs.
   2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies for the following:
   1. Equivalent gauge steel framing.
   2. Equivalent corrosion resistance protective coatings.
   3. Post-installed anchors and power-actuated fasteners.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or are a part of a similar organization that provides a verifiable code compliance program.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design framing systems in accordance with American Iron and Steel Institute Publication “S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members”, except as otherwise shown or specified.

B. Deflection Limits: Select steel studs in accordance with the manufacturer's standard load tables and following design pressures and deflections:
   1. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
   2. Interior Non-Load-Bearing Framing (with Plaster or Ceramic Tile Finish): Horizontal deflection of 1/360 of the wall height.
   3. Interior Ceiling Framing: Vertical deflection of 1/360 of the span.

C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS, GENERAL

A. Framing Members, General: Comply with ASTM C 644 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: ASTM A 653, G40 or coating with equivalent corrosion resistance of ASTM A 653, G40; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating.
      a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.
      b. Galvannealed products are not acceptable.
   3. Protective Coating - Interior High-Humidity Locations: ASTM A 653/A 653M, G60, hot-dip galvanized protective coating.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Cast-in-place anchor, designed for attachment to concrete forms postinstalled, chemical anchor, or postinstalled, expansion anchor.
   2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
   1. Depth: 1-1/2 inches, unless otherwise indicated.

F. Furring Channels (Furring Members):
   1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base Metal Thickness: 0.0179 inch, unless otherwise indicated.
   2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
      a. Provide resilient furring channels identical to those used in test assembly to achieve required STC rating.

G. Grid Suspension System for Ceilings: ASTM C 645, heavy duty classification, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Armstrong World Industries, Inc.; Drywall Grid Systems.
    b. Chicago Metallic Corporation; Drywall Grid System.
    c. USG Corporation; Drywall Suspension System.

H. Grid Suspension System - High-Humidity Ceilings: ASTM C645, heavy duty classification, 1 1/2 inch x 1 1/2 inch drywall suspension grid with knurled face; components die cut and interlocking. Cross tee holes spaced 8 inches oc.
1. Grid materials: Commercial quality cold rolled steel with G-90 hot-dipped galvanized finish.
2. Accessories: Clips, splices, edge moldings required for suspended grid system; G-90 hot-dipped galvanized finish.
3. Hangers: Monel wire, of size and type to suit application, to support ceiling components in place to deflection limits as indicated.
4. Support Channels: G-90 hot-dipped galvanized steel; size and type to suit application, and ceiling system flatness requirement specified.

2.4 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Tracks: ASTM C 645. Use either steel studs and tracks meeting minimum base-metal thickness or equivalent gauge thickness steel studs and tracks.
1. Depth: As indicated on Drawings.
2. Minimum Base-Metal Thickness: As required to meet performance requirements, but not less than 0.0179 inches.
    a. Jamb Framing: Install one stud and one runner, each of minimum 0.0329-inch base-metal thickness, interlocked to form box section on each side of opening. Locate one additional stud of minimum 0.0329-inch base-metal thickness directly adjacent to stud/runner box section. Mechanically fasten studs and runner to each other.
    b. Sill Framing: Install one stud and one runner, each of minimum 0.0329-inch base-metal thickness, interlocked to form box section at sill of opening. Locate one additional runner of minimum 0.0329-inch base-metal thickness directly under stud/runner box section to receive vertical studs. Mechanically fasten stud and runners to each other.
    c. Partitions Receiving Tile Finish: Minimum base-metal thickness of 0.0329 inch at steel framing members supporting tile installations.
3. Equivalent Gauge Thickness Steel Studs and Track: Members that demonstrate certified third-party testing in accordance with ICC ES AC86 (Approved May 2015) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. Submission of an evaluation report is acceptable to demonstrate conformance to this requirement.

B. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 3-inch- deep flanges in thickness not less than indicated for stud, installed with stud friction fit into top runner and with continuous bridging located within 12 inches of the top of stud to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 3-inch- deep flanges in thickness not less than indicated for stud and fastened to stud, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for stud and in width to accommodate depth of stud.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. ClarkDietrich Building Systems; BlazeFrame DSL.
   b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
   c. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.0428 inch.

E. U- Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.0538-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0179 inch.
   2. Depth: 7/8 inch, unless otherwise indicated.

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
   1. Provide resilient furring channels identical to those used in test assembly to achieve required STC rating.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4-inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch-thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where

offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
   1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
   2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
   3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
   4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
   2. Multilayer Application: 16 inches o.c., unless otherwise indicated.
   3. Tile backing panels: 16 inches o.c., unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical framing at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install interlocked, formed box section as described in Part 2 on each side of opening.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
   6. Curved Partitions:
      a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
      b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:

1. Install insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 16 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

B. Related Requirements:
   1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum.
   2. CertainTeed Corporation.
   3. Continental Building Products LLC.
   4. Georgia-Pacific Gypsum LLC.
   5. National Gypsum Company.
   6. USG Corporation.

B. Mold-Resistant Gypsum Board: ASTM C 1658/C 1658M; moisture- and mold-resistant core and coated glass-mat faced (both faces).
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Continential Building Products LLC; Weather Defense Platinum Interior.
      b. Georgia-Pacific Gypsum LLC; DensArmour Plus.
      c. National Gypsum Company; eXP Interior Extreme.
      d. USG Corporation; Sheetrock Brand, Glass-Mat Panels Mold Tough.
   2. Core: 5/8-inch, Type X.
   3. Long Edges: Tapered.
   4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-plastic-paper copolymer.
      a. Approved Plastic or Paper-Plastic Copolymer Manufacturers:
         1) CertainTeed Corporation.
         2) Trim-Tex Inc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. Expansion (control) joint.
      d. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Moisture- and Mold-Resistant Type Panel Trim: ASTM C 1047.
   1. Material: Hot-dip galvanized steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Glass-Mat Faced Gypsum Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Thickness: 3-1/2-inch thickness, unless otherwise indicated.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
   b. Grabber Construction Products; Acoustical Sealant GSC.
   c. Pecora Corporation; AC-20 FTR.
   d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
   e. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Mold-Resistant Type: Wall and ceiling surfaces receiving gypsum board, unless noted otherwise.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
      a. Set screws between 3/8 to 1/2 inch from edges.
      b. Drive screws so head rests in slight dimple without cutting face paper or fracturing core.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. LC-Bead: Use at exposed panel edges.
   3. Curved-Edge Cornerbead: Use at curved openings.

3.5 CONTROL JOINTS

A. Control Joints: Install control joints according to ASTM C 840, in locations as indicated below, and in specific locations approved by Architect for visual effect.

B. Install control joints to provide following maximum un-jointed lengths or areas:
   1. Partitions and Soffits: 30 feet maximum straight run.
      a. Where practical, locate vertical partition control joints aligned with jamb of openings.
      b. Install control joint at gypsum board joints that align with jambs of openings; 16-inch minimum offset required, unless otherwise approved by Architect.
   2. Ceilings: 50 feet with perimeter relief; 30 feet without perimeter relief in one direction; at change of direction or irregular shapes.
   3. Ceiling Area: 2,500 sq. ft, with perimeter relief; 900 sq. ft., without perimeter relief.

C. Calk control joints behind base flush; match base color.

D. Install suitable backing material to maintain required rating where control or expansion joints occur in fire or sound rated assemblies.

E. Install LC-bead where partition or ceiling abuts structural element or dissimilar wall or ceiling material.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
   1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
   2. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
   3. Apply joint treatment compound full height of partition in accordance with manufacturer's directions.
   4. Fill joints, screw heads and internal corners with compound.

B. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 4: Provide Level 4 finish unless otherwise indicated.
      a. Draw down final coat of compound to a smooth even plane.
      b. After drying, sand or otherwise smooth final coat of compound as needed to eliminate high spots or excess compound to leave smooth, even, and level surface.

C. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

D. Have wallboard surfaces primed by painter. After painter has applied primer to surfaces, repair and refinish defective areas.

E. If wallboard is damaged, or surfaces are roughened, repair, or remove and replace, to satisfaction of Architect, at no additional cost to Owner.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustical panel ceilings (APC).
   2. Exposed suspension systems for interior ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.
   2. Smoke-Developed Index: 450 or less.

B. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS

A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Acoustical Panel Ceiling – APC1:
   1. Basis of Design Product: USG Mars High-NRC Panels 85/35 Plant-Based Binder #88134.
   2. Suspension System: Type 1 - Steel.
   3. Modular Size: 24 by 24 inches.
   4. Thickness: 7/8 inch.
   5. Type and Form: Type III, Form 1, Pattern EI.
   6. Light Reflectance (LR): Not less than 0.90.
   7. Ceiling Attenuation Class (CAC): Not less than 35.
   8. Noise Reduction Coefficient (NRC): Not less than 0.85.
   9. Edge/Joint Detail: Square lay-in.
   10. Color: White.
   11. Warranty: Manufacturer 30-year sag-warp resistant for high humidity application.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

B. Suspension System Type 1 - Steel: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. End Condition of Cross Runners: Override (stepped) type.
   3. Face Design: Flat, flush.
   4. Cap Material: Cold-rolled steel.
   5. Cap Finish: Painted white.

2.5 ACCESSORIES

A. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Suspension System Type 1: Zinc-coated, carbon-steel wire, ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
   2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
a. As indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13-RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT BASE

A. Resilient Base:
   1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong World Industries, Inc.
b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
c. Flexco, Inc.
d. Johnsonite, a Tarkett Co.
e. Roppe Corporation, USA.
f. VPI, LLC; Floor Products Division.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
1. Group: I (solid, homogeneous).
2. Style and Location:
a. Style B, Cove: Provide in areas with resilient floor coverings or exposed concrete.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors and Patterns: As Scheduled on Drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Luxury vinyl tile (LVT).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of floor tile indicated.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE (LVT)

A. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Armstrong World Industries, Inc.
   2. J&J Classics
   3. Mannington Mills, Inc.
   4. Mohawk Industries.
   5. Patcraft.

B. Basis of Design Products: As Scheduled on Drawings.

C. Tile Standard: ASTM F 1700.
   1. Class: Class III, printed film vinyl tile.
   2. Type: Type A, smooth and Type B, embossed surface.

D. Wearing Surface: Urethane aluminum oxide topcoat cured by UV process.

E. Warranty: Not less than Basis of Design product warranty.

F. Colors and Patterns: As Scheduled on Drawings.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, debris and deposits that might interfere with installation of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale

recommended by manufacturer in writing. Proceed with installation only after substrates have passed tests.

4. Moisture and Relative Humidity Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrates have passed tests.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis, unless otherwise indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly secure tile edges to substrates that abut covers and to cover perimeters according to manufacturer’s installation instructions.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 19

SECTION 09 91 00 – PAINTS AND COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes substrate preparation and application of paint and coating systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include preparation requirements and application instructions.
   2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat. Submit actual paint drawdowns as specified below for verification Samples.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in applicable painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.

1.3 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. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F and maximum of 90 degrees F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

D. Comply with OSHA standards and local fire regulations.

1.4 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist, when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Provide lighting level of not less than 80 foot-candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers: Subject to compliance with requirements, provide products listed in Schedules at end of Part 3.

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide products in compliance with VOC limits of authorities having jurisdiction.

D. Colors: As indicated in Finish and Materials Legend.

2.2 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.

B. Patching Materials: Latex filler.

C. Fastener Head Cover Materials: Latex filler.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry (Clay and CMU): 12 percent.
   3. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with finishes and field or shop-applied primers. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.
   2. Concrete Substrates: Prepare and apply a prime coat to three test areas. Perform adhesion test and establish adhesion rating according to ASTM D3359 Test Method A. Prepare written report including photograph of each test area and submit results to Architect.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Correct defects capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.

D. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

F. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Use abrasive blast cleaning methods and surface profiling procedures recommended by the paint manufacturer. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

G. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

H. Steel Substrates: Remove rust, grease, mill scale, weld splatter, and dirt, ensuring weld joints, bolts, and nuts are similarly cleaned. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 3, "Power Tool Cleaning."

I. Shop-Primed Steel Substrates: Sand and scrape to remove loose primer and rust. Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed substrates.
   1. Feather edges to make touch-up patches inconspicuous.

J. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

K. Aluminum Substrates: Remove loose surface oxidation.

L. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

M. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Sand metal surfaces lightly between coats to achieve required finish.
8. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
9. Prime concealed surfaces of interior and exterior woodwork with primer paint.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
1. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer, unless otherwise indicated.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Concrete masonry that is coated with an epoxy finish shall have a pinhole free surface as final surface finish.

F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint shop primed equipment indicated to receive paint finish.
2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
3. Prime and paint insulated and exposed pipes, tanks, conduit, boxes, electrical equipment, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished or occurring in unfinished interior spaces.
4. Paint interior surfaces of air ducts and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint applied to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
5. Paint both sides and edges of plywood backboards for electrical, security and communication equipment before installing equipment.
6. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
7. Do not paint over telecommunications cables or detection or monitoring devices.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
   1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
   2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
   3. Allow empty paint cans to dry before disposal.
   4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal Substrates: High performance acrylic coating; two (2) finish coats over prime coat.
   1. Prime Coat: (Omit prime coat on factory-primed substrates.)
      a. Pittsburg Paints; Pitt Tech Plus Primer.
      b. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
   2. Finish Coat:
      a. Pittsburg Paints; Pitt-Tech Plus. Semi-Gloss, 4216HP.
      b. Sherwin-Williams; Sher-Cryl HPA, Semi-Gloss, B66-350 Series.

B. Galvanized Metal Substrates: High performance acrylic coating; two (2) finish coats over prime coat.
   1. Prime Coat:
      a. Pittsburg Paints; Pitt Tech Plus Primer.
      b. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
   2. Finish Coat:
      a. Pittsburg Paints; Pitt-Tech Plus. Semi-Gloss, 4216HP.
      b. Sherwin-Williams; Sher-Cryl HPA, Semi-Gloss, B66-350 Series.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces: Pre-catalyzed, single-component epoxy coating; two (2) finish coats over prime coat.
   1. Prime Coat:
      a. Pittsburg Paints; Perma-Crete Int/Ext Acrylic Alkali Resistant Primer.
      b. Sherwin-Williams; Loxon Concrete and Masonry Primer, LX02 Series.
   2. Finish Coats:
      a. Pittsburg Paints; PITT-GLAZE WB1 Water-Borne Acrylic Epoxy, Semi-gloss Series.
      b. Sherwin-Williams; Pre-Catalyzed Water Based Epoxy, Semi-gloss K46-150 Series.

B. CMU Substrates: Pre-catalyzed, single-component epoxy coating; two (2) finish coats over prime coat.

1. Prime Coat:
    a. Pittsburg Paints; Speedhide Interior/Exterior Hi-Fill Block Filler.
    b. Sherwin-Williams; Pro Industrial HD Block Filler B42W00150.
2. Finish Coats:
    a. Pittsburg Paints; PITT-GLAZE WB1 Water-Borne Acrylic Epoxy, Semi-gloss Series.
    b. Sherwin-Williams; Pre-Catalyzed Water Based Epoxy, Semi-gloss K46-150 Series.

C. CMU Substrates - Wash Bay: Epoxy coating; two (2) finish coats over prime coat.
1. Prime Coat:
    a. Pittsburg Paints; PPG Amerlock 400BF Two-Component Epoxy Block Filler.
    b. Sherwin-Williams; Kem Cati-Coat HS Epoxy Block Filler.
2. Finish Coats:
    a. Pittsburg Paints; PPG Amerlock 600 Fast-Cure Two-Component Polyamide Epoxy, 5.0 – 10.0 mils, DFT.
    b. Sherwin-Williams; Macropoxy 646 FC Two-Component Polyamide Epoxy, 5.0 – 10.0 mils, DFT.

D. Steel Substrates, (Overhead Steel Structure, Metal Deck, Exposed Mechanical and Electrical Components):
1. Acrylic Dryfall System:
    a. Prime / Spot Prime Coat: Omit prime coat on shop primed components; spot prime corroded or unprimed surfaces.
        1) Pittsburg Paints; Pitt Tech Plus EP Acrylic DTM Metal Primer.
        2) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-1300 Series.
    b. Finish Coat:
        1) Pittsburg Paints; Speedhide Super Tech WB Interior 100% Acrylic Dry-Fog, Eggshell.
        2) Sherwin-Williams; Pro Industrial Waterborne Acrylic Dryfall, Eg-Shel.

E. Steel Substrates, (Steel Columns, Metal Fabrications, Steel Stairs and Railings, Metal Doors and Frames): Acrylic epoxy coating, two (2) finish coats over prime coat.
1. Prime Coat: (Omit prime coat on shop primed components).
    a. Pittsburg Paints; Pitt Tech Plus EP Acrylic DTM Metal Primer.
    b. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-1300 Series.
2. Finish Coats:
    a. Pittsburg Paints; PITT-GLAZE WB1 Water-Borne Acrylic Epoxy, Semi-Gloss Series;
    b. Sherwin-Williams; Pre-Catalyzed Water Based Epoxy, Semi-gloss K46-1150 Series.

F. Steel Substrates - Wash Bay (Steel Columns, Metal Fabrications, Metal Doors and Frames): High performance acrylic coating; two (2) finish coats over prime coat.
1. Prime Coat:
    a. Pittsburg Paints; Pitt Tech Plus Primer.
    b. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
2. Finish Coat:
    a. Pittsburg Paints; Pitt-Tech Plus. Semi-Gloss, 4216HP.
    b. Sherwin-Williams; Sher-Cryl HPA, Semi-Gloss, B66-350 Series.

G. Gypsum Board Substrates, Ceilings: Vinyl acrylic coating; two (2) finish coats over prime coat.
1. Prime Coat:
    a. Pittsburg Paints; Speedhide Interior Latex Primer/Sealer.
    b. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2. Finish Coats:
    a. Pittsburg Paints; Speedhide Zero VOC, Eggshell.

b. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex, Low-Sheen Eg-Shel B24-2600 Series.

H. Gypsum Board Substrates: Pre-catalyzed, single-component epoxy coating; two (2) finish coats over prime coat.
   1. Prime Coat:
      a. Pittsburg Paints; Speedhide Interior Latex Primer/Sealer.
      b. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
   2. Finish Coats:
      a. Pittsburg Paints; PITT-GLAZE WB1 Water-Borne Acrylic Epoxy, Eggshell Series.
      b. Sherwin-Williams; Pre-Catalyzed Water Based Epoxy, Eg-Shel K45-1150 Series.

END OF SECTION 09 91 00

SECTION 10 14 53 – TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior traffic signs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

PART 2 - PRODUCTS

2.1 EXTERIOR METAL TRAFFIC SIGNAGE

A. The following traffic signage shall be bollard panel signage and shall comply with the most current edition MUTCD. Panel: 0.63 aluminum screen printed. Size is located by each sign. See plan for quantities.
   1. Sign Types:

RESERVED PARKING (FOR PERSONS WITH DIABILITIES) MUTCD TYPE R7-8 (12X18) S1, SEE PLAN	**RESERVED PARKING** (FOR PERSONS WITH DIABILITIES) MUTCD TYPE R7-8 (UPPER SIGN) (12X18) VAN ACCESSIBLE MUTCD TYPE R7-8B (LOWER SIGN) S2, SEE PLAN

2. Sign Posts: 2-1/2” diameter galvanized steel pipe with water tight cap. Mount bottom of sign at 5’-6” (minimum) above finished grade, extend post 48” below grade in 8” diameter concrete footing; terminate sign post at top of sign.
3. Bollard for sign post. See detail in Drawings.
4.

5. Sign Posts: Not required. Mount sign to chain link fence.
6. Quantity: See Plan.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 14 53

SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet and bath accessories.
   2. Custodial accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated on Drawings.
   2. Identify products using designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Specialties, Inc.
   2. Bradley Corporation.
   3. Bobrick Washroom Equipment, Inc.

B. Basis of Design Products: As Scheduled on Drawings.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 10 41 16 - EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes key access box and accessories.

1.2 SUBMITTALS

A. Product Data: Submit data on key access box and accessories.
   1. Indicate elevations, dimensions, and special anchor details.
   2. Include manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 KEY ACCESS BOX

A. Key Access Box: Knox Company, Knox-Box Model 3200 Recessed Mount with hinged door.
   1. Size: 4 x 5 x 3 1/4 inches with 7 x 7-inch flange.
   2. Lock: UL listed; double-action rotating tumblers and hardened steel pins accessed by a biased cut key.
   3. Finish: Provide manufacturer's additional rust and corrosion protection finish (Aluminization) and proprietary finishing process.
      a. Color: Black.
   4. Provide with Knox-Box Model 3200 Recessed Mounting Kit (RMK) for recess mount application.
   5. Substitutions: Not Permitted.

B. Fasteners: Provide anchors and fasteners suitable for substrate conditions as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install recessed wall mounted unit in accordance with manufacturer's instructions.

B. Secure unit level and plumb.

C. Clean unit in accordance with manufacturer's instructions.

END OF SECTION 10 41 16

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Amerex Corporation.
      b. Ansul by Johnson Controls Company.
      c. Babcock-Davis.
      d. Badger Fire Protection.
      e. JL Industries, Inc.; a division of the Activar Construction Products Group.
      f. Kidde Residential and Commercial Division.
      g. Larsens Manufacturing Company.

h. Nystrom.
i. Potter Roemer LLC; a Division of Morris Group International.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical; enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard bracket, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Knocked-down metal lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: For metal lockers.
   1. Include plans, elevations, sections, and attachment details.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate sizes and locations of bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 KNOCKED-DOWN METAL LOCKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Art Metal Products.

2. ASI Storage Solutions.
3. DeBourgh Mfg. Co.
4. Hadrian Manufacturing Inc.
5. List Industries Inc.
6. Lockers Manufacturers.
7. Olympus Lockers & Storage Products, Inc.
8. Penco Products, Inc.
9. Republic Storage Systems, LLC.

B. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
   1. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
   2. Door Style: Vented panel as follows:
      a. Louvered Vents: No fewer than six louver openings at top and bottom for single-tier lockers.

C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
   1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
   2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
   3. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
   1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
   1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.

F. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
   1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.
      a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
      b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

G. Locks: Stainless steel padlock hasp; user-provided lock.

H. Accessible Lockers: Fabricate as follows:
   1. Provide door decal with international accessibility symbol.
   2. Provide stainless steel pull in compliance with ADA guidelines.
   3. Locate bottom shelf no lower than 15 inches above the floor.

4. Locate lock, pull, hooks, or shelves no higher than 48 inches above the floor.
5. Lock System: Built-in keyless lock requiring no card, wired connection, or battery with ADA-compliant lever requiring force of less than 5 lbs. and no pinching or twisting of wrist to operate; user-provided code with manager key override.
    a. Finish: Satin nickel.

I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

J. Hooks: Manufacturer's standard ball-pointed hooks, aluminum or steel; zinc plated.

K. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

L. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

M. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

N. Boxed End and Top Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.

O. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

P. Finish: Baked enamel or powder coat.
1. Color: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

D. Knocked-Down Construction: Fabricate metal lockers by preassembling at plant prior to shipping, using manufacturer's nuts, bolts, screws, or rivets.

E. Boxed End and Top Panels: Fabricated with 1-inch- wide edge dimension and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

2.4 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.
1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 STEEL SHEET FINISHES

A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

B. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application and baking.
   1. Finish: Baked pure TGIC polyester powder coat with a minimum 2-3 mil, minimum dry film thickness.
   2. Color: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
   2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment:
   1. Attach hooks with at least two fasteners.
   2. Attach door locks on doors using security-type fasteners.
   3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
      a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach boxed end and top panels using concealed fasteners to conceal exposed ends and tops of nonrecessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural-steel framing.
   2. Metal roof panels.
   3. Metal wall panels.
   4. PVC wall panels.
   5. Thermal insulation.
   6. Doors and frames.
   7. Windows.
   8. Aluminum-framed awning/canopy.
   9. Accessories.

B. Related Sections:
   1. Section 08 11 13 “Hollow Metal Doors and Frames” for hollow metal door and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

B. Shop Drawings: For metal building system components. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Metal Building System Certificates: For each type of metal building system, from manufacturer.
   1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
      a. Name and location of Project.
      b. Order number.
      c. Name of manufacturer.
      d. Name of Contractor.
      e. Building dimensions including width, length, height, and roof slope.
      f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
      g. Governing building code and year of edition.
      h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
      i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
      j. Building-Use Category: Indicate category of building use and its effect on load importance factors.

k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

C. Material test reports.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

E. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

F. Preinstallation Conference: Conduct conference at Project site.

1.6 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 25 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Ceco Building Systems; Division of NCI Building Systems, L.P. Subject to compliance with requirements, provide products by the named manufacturer or comparable product by one of the following:
   1. A&S Building Systems, Inc.; Division of NCI Building Systems, L.P.
   2. Alliance Steel, Inc.
   3. American Buildings Company; Division of Magnatrax Corp.
   4. American Steel Building Co., Inc.
   5. BC Steel Buildings, Inc.
   6. Behlen Mfg. Co.
   7. Bigbee Steel Buildings, Inc.
   8. Butler Manufacturing Company; a BlueScope Steel company.
   9. CBC Steel Buildings; Division of Magnatrax Corp.
   10. Ceco Building Systems; Division of NCI Building Systems, L.P.
   11. Chief Buildings; Division of Chief Industries, Inc.
   12. Elite Structures, Inc.
   13. Garco Building Systems; Division of NCI Building Systems, L.P.
   14. Gulf States Manufacturers, Inc.; Division of Magnatrax Corp.
   15. Inland Buildings; Subsidiary of Behlen Mfg. Co.
   16. Kirby Building Systems; Division of Magnatrax Corp.
   17. Mesco Building Solutions; Division of NCI Building Systems, L.P.
   18. Metallic Building Company; Division of NCI Building Systems, L.P.
   19. Metco Metal Supply.
   20. Mid-West Steel Building Company; Division of NCI Building Systems, L.P.
   21. Nucor Building Systems.
   22. Oakland Metal Buildings, Inc.
   23. Olympia Steel Building Systems.
   24. Package Industries, Inc.
   25. Pinnacle Structures, Inc.
   26. Robertson Building Systems; an NCI company.
   27. Ruffin Building Systems, Inc.
   28. Schulte Building Systems, LLP.
   29. Spirco Manufacturing.
   30. Star Building Systems; an NCI company.
   31. Tyler Building Systems, L.P.
   32. USA, Inc.
   33. VP Buildings; a United Dominion company.
   34. Vulcan Steel Structures, Inc.
   35. Whirlwind Building Systems.

2.2 METAL BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall be designed according to procedures in MBMA's "Metal Building Systems Manual."
   1. Design Loads (Basis of Design):
      a. Wind Load: 90 mph / Ultimate 115 mph.
      b. Wind Exposure: C.
      c. Snow Load: 20 lb/sf.
      d. Rood Live Load: 20 lb/sf.
      e. Seismic Design Category: A.

2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
    a. Purlins and Rafters: Vertical deflection of 1/180 of the span.
    b. Girts: Horizontal deflection of 1/240 of the span.
    c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
    d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
    e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
    a. Lateral Drift: Maximum of 1/200 of the building height.
4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.013 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft.

F. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.01 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft.

G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 12.00 lbf/sq. ft.

H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
1. Test-Pressure Difference: 20 lbf/sq. ft.

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

2.3 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.
2. Frame Configuration: Single gable.
3. Exterior Column Type: Tapered.
4. Rafter Type: Tapered.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.

C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating.

D. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.

E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Preparation: SSPC-SP3 Power Tool Cleaning.
2. Primer: Tnemec; Uni-Bond DF Series 115, 3.0 mils dry film thickness.

2.4 METAL ROOF PANELS

A. Trapezoidal-Rib, Standing-Seam Metal Roof Panels. Formed with ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Basis of Design: Ceco Building Systems; Double-Lok Panel.
2. Material: Aluminum-zinc alloy-coated steel sheet, 24-gauge nominal thickness
    a. Exterior Finish: Two-coat fluoropolymer.
        1) Colors: As Scheduled on Drawings.
3. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from material compatible to roof sheet material.
4. Joint Type: Panels snapped together.
5. Joint Type: Mechanically seamed, double folded, folded according to manufacturer's standard.
6. Panel Coverage: 24 inches.
7. Panel Height: 3 inches nominal.
8. Uplift Rating: UL 90.

2.5 METAL WALL PANELS

A. Exterior Metal Wall System: Concealed-fastener, foamed-insulation-core metal wall panel system.

B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Foamed-Insulation-Core Metal Wall Panels: Steel-faced, shop-assembled, factory-foamed, insulated panel units with double tongue-and-groove, side-joint design, and fasteners concealed within side joint; one piece from base to top of wall.
1. Basis of Design: Metl-Span; CF Mesa Wall Panel. Subject to compliance with requirements provide the named product or a comparable product by one of the following:
    a. CENTRIA, a Nucor Brand.
    b. Kingspan Insulated Panels.
    c. Metl-Span.
2. Nominal Thickness: 2 inches.
3. Exterior Face:
    a. Nominal Width: 42 inches.
    b. Surface Profile: Lightly corrugated; longitudinal planks spaced at nominal 4 inches on center and 1/8-inch deep.

c. Finish: Non-directional embossed finish.

4. Interior Face: Roll-formed from pre-painted steel with 1/16-inch-deep corrugations on 6-inch centers.
5. Panel Material and Finish:
   a. Corrugated Exterior-Faced Panels: 26-gauge, AZ50 aluminum-zinc coated steel.
   b. Interior Face: 26-gauge, AZ50 aluminum-zinc coated steel.
   c. Core: Poured-in-place polyurethane foam with a minimum 93 percent closed-cell structure.
   d. Exterior Panel Finish: Two-coat fluoropolymer.
      1) Colors: As Scheduled on Drawings.
   e. Interior Panel Finish: Paint with USDA-approved interior white polyester paint.
6. Panel Physical Properties:
   a. R-Value : Based on actual test results from ASTM C 518 of panel core material.
      1) 2-Inch-Thick Panels: 17.5
   b. Insulated Panels: Carry the following listings:
      1) Factory Mutual Class 1 Rating for wall and ceiling construction FM 4880.
      2) Guide NYWR, Insulated Wall Construction Subject 1040.
      3) Surface Burning Characteristics: Panel core (6-inch unfaced) tested in accordance with ASTM E 84.
         a) Flame Spread: 25.
         b) Smoke Developed: 450.
7. Fasteners:
   a. Base, Top, and Girt Connections and Panel Joint Clip Attachments: #14 self-drilling screws.
      1) Install additional “Lockrivet” fasteners, if necessary due to wind load.
   b. Panel-to-Panel Fasteners: Not required.
      1) Connections: Hidden, eliminating exposed fasteners.

D. Tapered-Rib, Metal Liner Panels : Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
   1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
      a. Exterior Finish: Siliconized polyester.
         1) Colors: As Scheduled on Drawings.
   2. Major-Rib Spacing: 12 inches (305 mm) o.c.
   3. Panel Coverage: 36 inches (914 mm).
   4. Panel Height: 1.25 inches (32 mm).

E. Accessories:
   1. Accessories (i.e., doors, windows): Design to fit wall panel system or framed openings and furnish as standard by metal building system manufacturer, unless otherwise noted.
   2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer

2.6 PVC WALL PANELS

A. Interior PVC Wall Panels: 100 percent exterior grade virgin cellular PVC formulation with interlocking tongue and groove panel to panel joints; Class A fire rating.

B. Basis of Design: Delcan Products Ltd.; DelPro Interlocking PVC Panel #1638 (Smooth).

C. Wall Thickness: 0.040 inch.

D. Overall Panel Thickness: 3/8 inch.

E. Trim: PVC wall panel manufacturer's standard PVC profiles inside cove and J-trim.

F. Fasteners: Concealed, stainless-steel; type and size as recommended by PVC wall panel manufacturer for substrate and conditions indicated.

G. Joint Sealant: Silicone, type and product as recommended by PVC wall panel manufacturer.

H. Colors: As Scheduled on Drawings.

2.7 THERMAL INSULATION

A. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, mineral wool or glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch- wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Rigid fiberglass insulation for continuous insulation layer.

C. Vapor Retarder/Fall Protection: Polyethylene vapor retarder liner fabric in white color; galvanized metal support straps (bands).
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Silver-Cote; Energy Saver FP Liner System.
      b. Therm-All; ProLiner Banded Liner System (LS).
   2. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
      a. ASTM C1136, Types I through Type VI. Type I-IV exception for dimensional stability (value is less than 2.0 percent).
      b. Perm Rating: Maximum 0.02 when tested in accordance with ASTM E 96 Procedure A.
      c. Surface Burning Characteristics: Flame Spread Index of 0 and Smoke Developed Index less than 50 when tested in accordance with ASTM E 84.
      d. Vapor Barrier Adhesive: Application temperature of 0 to 110 degrees F.
      e. Double Sided Vapor Barrier Tape: Width 0.75 to 1.5 inches, rubber or acrylic base.
      f. Patch Tape: Adhesive added to one side; installation temperature of 10 to 110 degrees F, width: 3 inches.
   3. Metal Banding/ Straps: Coated steel, width 1.0 inch, structural steel Grade 50 per ASTM C 653, exposed color to match vapor barrier, gray backing color.

D. Thermal Spacer Blocks: Extruded or expanded polystyrene.
   1. Thickness: 0.5 to 1.0 inches.
   2. Minimum width: 3.0 inches

2.8 WINDOWS

A. Aluminum Windows: Metal building system manufacturer's thermally-broken units, with self-flashing mounting fins, and as follows:
   1. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:
      a. Horizontal-Sliding Units: HS-C30.
      b. Fixed Units: F-C30.
   2. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
      a. Cam-action sweep sash lock and keeper at meeting rails.
      b. Spring-loaded, snap-type lock at jambs.
      c. Nylon sash rollers for horizontal-sliding units.
   3. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric; complying with AAMA 701/702.
   4. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit.

B. Glazing: Comply with requirements specified in Division 08 Section "Glazing."

C. Finish:
   1. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
      a. Color: As selected by Architect from manufacturer's full range.

2.9 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
   1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Colors: As Scheduled on Drawings.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

D. Flashing and Trim: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

E. Gutters: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
   1. Gutter Supports: Fabricated from same material and finish as gutters.
   2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Formed from 0.022-inch nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
   1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Roof Ventilation
   1. Continuous or Sectional-Ridge Type: Factory-engineered and -fabricated, continuous unit; fabricated from 0.022-inch nominal-thickness, aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal roof panels. Fabricated in minimum 10-foot- long sections. Provide throat size and total length indicated, complete with side baffles, ventilator assembly, end caps, splice plates, and reinforcing diaphragms.

2. Bird Screening: Galvanized steel or aluminum.

H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to evaluate product.

B. Special Inspector: Owner will engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
   1. Special inspections will not be required if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
      a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

C. Testing: Test and inspect shop connections for metal buildings according to the following:
   1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

D. Product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

2.11 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.
   1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
   2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

D. Secondary Framing: Shop fabricate framing components to size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated

performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

2.12 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
   1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
   3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted

anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
    a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Locate canopy framing as indicated.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.2 METAL PANEL INSTALLATION, GENERAL

A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.3 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
   1. Install ridge and hip caps as metal roof panel work proceeds.
   2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
   1. Install clips to supports with self-drilling or self-tapping fasteners. Predrill holes where possible.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
   4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
   5. Provide metal closures at peaks, rake edges and rake walls, and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
   2. Shim or otherwise plumb substrates receiving metal wall panels.
   3. When two rows of metal panels are required, lap panels 4 inches minimum.
   4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
   5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
   6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
   7. Install screw fasteners in predrilled holes.
   8. Install flashing and trim as metal wall panel work proceeds.
   9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
   10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
   11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer. Provide thermal blocks at fastener locations for thermal isolation.

C. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches (1067 mm) o.c., spaced not more than manufacturer's written instruction. Fully engage tongue and groove of adjacent insulated metal wall panels.
   1. Install clips to supports with self-tapping fasteners.
   2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.

3.5 METAL SOFFIT PANEL INSTALLATION

A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.

B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.6 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
   1. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
   2. Install vapor barrier.

B. Blanket Roof Insulation: Comply with the following installation method:
   1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
      a. Thermal Spacer Blocks: Where metal roof panels attach directly to zee furring strips or purlins, install thermal spacer blocks.
   2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
   1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
   2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

3.7 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to SDI A250.8.

C. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing."

D. Door Hardware: See division 8 for doors and hardware. Mount units at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames." Attach a channel at perimeter of opening and secure it to the horizontal girts.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
3. Set thresholds for exterior doors in full bed of butyl-rubber sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.8 WINDOW INSTALLATION

A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.
   1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Mount screens directly to frames with tapped screw clips.

E. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing."

3.9 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c.

using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
   1. Tie downspouts to underground drainage system indicated.

E. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.

F. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.10 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Tests and Inspections:
   1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

D. Product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 13 34 19

SECTION 21 00 50

BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Fire Suppression Requirements specifically applicable to Mechanical Division Specification Sections.

B. Division 21 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 OWNER OCCUPANCY

A. The owner will not occupy the premises during the construction period.

B. Limit use of site and premises to allow owner occupancy.

C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

D. Schedule the work to accommodate this requirement.

1.03 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by the contractor, by the contractor's employees or through any operation under the contractor's charge, whether in the contract or as extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve this contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:
   1. The National Board of Fire Underwriters
   2. The American Gas Association
   3. The National Fire Protection Association (NFPA)
   4. The Occupations Safety and Health Act (OSHA)
   5. Current IBC Building Code
   6. Current applicable city building codes
   7. Fire Protection: Conform to UFC and NFPA

F. Mechanical: Conform to current mechanical code.

G. Plumbing: Conform to current plumbing code.

H. Obtain permits and request inspections from authority having jurisdiction.

1.04 QUALIFICATIONS

A. The fire suppression installer must be a company specializing in applying the work of this division with a minimum of five years experience.

1.05 SYSTEM DESCRIPTION

A. Design and install the system to NFPA 13.

B. New system: A new wet sprinkler system shall be installed in the [new] [existing] building.

1.06 PROJECT/SITE CONDITIONS

A. Install work in locations shown on the drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer prior to proceeding.

C. This contractor, before submitting their bid, shall visit the site of the project to become familiar with locations and conditions affecting their work.

D. It is the intent of this specification that this contractor furnish all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. This contractor shall provide holes as necessary for the installation of their work and in accordance with other specification sections in materials other than the structure.

1.07 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to ensure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.08 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished, and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.09 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.10 PROTECTION AND MAINTENANCE

A. The work covered by these drawings and specifications involves all work in the [new] [existing] building.

B. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

D. This contractor shall protect existing equipment in all finished areas from dirt, dust and damage as a result of their work.

E. Coordinate protection requirements with department heads before beginning construction.

F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of their work in all new buildings unless otherwise noted.

B. In areas where the integrity of new fire separation assembly/wall is compromised by the work, contractor shall be responsible to patch and/or seal openings as necessary to maintain/return fire separation to rating as required by applicable codes.

C. This contractor shall arrange for openings in the building as required for the installation of equipment furnished under this contract. Where piping must be extended or changed, patching with concrete will be done in the building. Patching shall be at both the top and bottom of sleeves where above grade.

1.12 CLEANING AND RUBBISH

A. This contractor shall upon completion of their work, remove all rubbish and debris resulting from this contractor's operation and shall remove it from site at their own expense.

B. In so far as this contractor's work is concerned, all equipment shall be cleaned and the premises left in first class condition.

C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from their work.

1.13 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify with the architect drawings the rating and location of all such construction and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
   1. Dow Corning "Silicone RTV Foam"
   2. 3-M Corporation "Fire Barrier Caulk and Putty"
   3. Thomas & Betts "Flame Safe Fire Stop System"

D. Installation of these products to be in strict accordance with manufacturer's recommendations and architectural specification sections or equivalent fire stopping general specification section.

E. The contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.14 HAZARDOUS MATERIALS

A. If the contractor stores any hazardous solvents or other materials on the site, the contractor shall obtain copies of the safety data sheets for the materials and post them on the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.

1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.15 AS-BUILT DRAWINGS

A. This contractor shall provide, at the conclusion of the project, one clean, non-torn, neat, and legible "as-built" set of drawings to the owner. These drawings shall show the routing of pipes and equipment drawn in at scaled locations. All dimensions indicated shall be referenced to a column line. A set of construction drawings will be furnished for this work.

B. All sprinkler systems installed shall be shown on the "as-built" drawings.

C. Refer to respective general specification section for additional information.

D. This contractor shall update these drawings during the project at least every week.

1.16 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer for review one (1) electronic copy of a brochure giving a complete list of materials and equipment they propose to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions and illustration. One of these returned copies shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless the contractor notifies engineer in writing of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set signifying that the contractor has checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.17 TEST OF SYSTEMS

A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall be held responsible for all damage resulting from defects in the system.

C. At the conclusion of construction (before any covering up, painting or finishing) each element of the system shall be thoroughly tested against leakage with appropriate pressure tests as outlined herein and in appropriate sections of the specifications. All testing shall be hydrostatic unless permission is granted otherwise.
   1. Underground Fire Lines: 200 psi. Maintain in accordance with NFPA 13.

D. Fluid lines other than the above shall be tested in accordance with NFPA 13.

E. After completion of installation, the systems shall be given tests under full operating conditions and pressures and all adjustments shall be made to make the system operative as required. All safety devices shall be tested for correct operation.

1.18 SCOPE OF WORK

A. All work shall be performed by well-qualified and licensed mechanics with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their mechanics are familiar with all the various codes and tests applicable to this work.

B. All equipment shall be new and of the type as specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

C. The intent of the drawings and specifications is for complete installation of the systems outlined in the drawings and specifications so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.

D. This contractor shall be required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The drawings and specifications cannot deal individually with the many minute items that may be required by the nature of the systems.

E. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

F. The Fire Suppression Contractor shall establish system elevations prior to fabrication and installation. The Fire Suppression Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate.
   3. Electrical bus duct.
   4. Sheet metal.
   5. Cable trays, including access space.
   6. Other piping.
   7. Conduits and wireway.

1.19 VERIFICATION OF ELEVATION OF EXISTING LINES

A. This contractor, before starting any new work, shall verify the elevations of all existing piping to which they must connect under this contract. The contractor shall report any discrepancies between drawing elevations and actual elevations to the engineer before proceeding with the work. Failure of the contractor to do so shall make the contractor liable for the cost of extra work involved.

1.20 DAILY HOUSEKEEPING

A. At the end of each working day, this contractor shall remove all of their debris, rubbish, tools and surplus materials from the project work area. The work area shall be broom clean and left in a neat and orderly condition. This contractor, for the removal of debris from the project, shall not use the owner's waste disposal facility.

B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.21 CLEANING OF MECHANICAL SYSTEMS

A. This contractor shall clean all piping systems by flushing with water until free from all sand, grit, gravel, oil, etc.

B. Where connections are made to existing piping systems, this contractor shall provide isolation valves, threaded tees, etc., as required to facilitate the cleaning and testing of all new piping.

C. This contractor shall thoroughly clean all rust, grease, plaster, cement, etc., from all equipment and piping furnished and installed by them as required to leave surfaces suitable for finish painting.

D. This contractor shall keep all pipes, plugged, drained or otherwise protected during construction. All items of mechanical equipment shall be suitably protected and upon completion of project shall be equal to new condition.

1.22 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. All underground utilities, piping, etc shall be located exactly before digging. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional requirements.

1.23 ALTERNATES

A. Refer to General Specification Sections for alternate bid description.

1.24 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 21 00 50

SECTION 21 05 29

HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers and supports

B. Accessories

C. Sleeves

1.02 REFERENCES

A. ASME B31.1 - Power Piping

B. ASME B31.9 - Building Services Piping

C. ASTM F708 - Design and Installation of Rigid Pipe Hangers

D. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer

E. MSS SP69 - Pipe Hangers and Supports - Selection and Application

F. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

G. NFPA 13 - Installation of Sprinkler Systems

H. NFPA 14 - Installation of Standpipe and Hose Systems

I. UL 203 - Pipe Hanger Equipment for Fire Protection Service

1.03 SUBMITTALS

A. Product Data: Provide manufacturers catalog data including load capacity.

B. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.

B. Supports for Sprinkler Piping: In conformance with NFPA 13.

C. Supports for Standpipes: In conformance with NFPA 14.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Grinnell
   2. Tolco
   3. Engineer approved equal.

B. Fire Protection Piping:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes Two Inch (2") and Over: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes to Three Inches: Cast iron hook.
   5. Wall Support for Pipe Sizes Four Inch (4") and Over: Welded steel bracket and wrought steel clamp.
   6. Vertical Support: Steel riser clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Provide zinc coated hangers and supports for all non air conditioned areas.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end or continuous threaded.

B. Install in accordance with manufacturer's instructions.

2.03 SLEEVES

A. Sleeves for pipes through wall below grade shall be Schedule 40, two pipe diameters larger than pipe. Seal with Linkseal.

B. Sleeves for pipes through non-fire rated floors shall be 18 gauge galvanized steel.

C. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors shall be Schedule 40 steel pipe or 18 gauge galvanized steel.

D. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing to be a fire rated sleeve assembly including seals, UL listed.

E. Stuffing and Firestopping Insulation: Fiberglass type, non-combustible per UL tested assembly type.

F. Sealant Manufacturers:
   1. Dow Corning Silicone RTV Foam.
   2. 3-M Fire Barrier Caulk and Putty.
   3. Thomas & Betts Flame Safe Fire Stop System.
   4. Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

A. Provide hanger rod size and spacing in accordance to NFPA requirements.

B. Support piping in accordance to NFPA requirements.

C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inch of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support vertical piping at every floor.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Design hangers for pipe movement without disengagement of supported pipe.

J. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction.

C. Extend sleeves through floor one inch (1") above finished floor level. Caulk sleeves.

D. Provide sleeves where piping penetrates floor, ceiling or wall fire rated assemblies. Close off space between pipe or duct and adjacent work with fire stopping insulation and caulk.

E. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install chrome plated steel escutcheons at finished surfaces and within cabinets.

3.04 SCHEDULES

HANGER ROD PIPE SIZE	MAX. HANGER SPACING FEET	DIAMETER INCHES
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 to 6	10.0	5/8
8 to 12	14.0	7/8
14 and Over	20.0	1

END OF SECTION 21 05 29

SECTION 21 12 00
FIRE SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sprinkler and standpipe piping

B. Ball valves

C. Butterfly valves

1.02 RELATED SECTIONS

A. Specification Section 21 1300 - Fire Suppression Sprinkler Systems

1.03 REFERENCES

A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300

B. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250

C. ANSI/ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings

D. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

E. ANSI/ASME Sec 9 - Welding and Brazing Qualifications

F. ANSI/ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

G. ANSI/ASTM A135 - Electric Resistance Welded Steel Pipe

H. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use

I. ASTM B88 - Seamless Copper Water Tube

J. AWS A5.8 - Specifications for Filler Metal for Brazing and Braze Welding

K. NFPA 13 - Installation of Sprinkler Systems

L. NFPA 14 - Standpipe and Hose Systems

1.04 SUBMITTALS

A. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor, and wall penetration seals.

B. Product Data: Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 OPERATION AND MAINTENANCE

A. Maintenance Instructions: Include installation instructions, spare parts list, procedures and treatment programs.

1.06 QUALITY ASSURANCE

A. Standpipe and Hose System: Perform to NFPA 14.

B. Welding Materials and Procedures: Perform to ASME Code.

C. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

D. Maintain one copy of each document on site.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, protect and handle products to site.

B. Deliver and store valves in shipping containers with labeling in place.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 SPRINKLER AND STANDPIPE PIPING (ABOVE GROUND)

A. Steel Pipe:
   1. Two Inch (2") and Smaller: ASTM A135/A53, Schedule 40 black mill steel.
   2. 2-1/2 Inch and Larger: ASTM A135/A53, Schedule 10 black mill steel.
   3. Fittings:
      a. Steel Pipe 2 Inch and Smaller: ANSI/ASME B16.4 cast iron or ANSI/ASME B16.3 malleable iron, threaded.
      b. Steel Pipe 2-1/2 Inch and Larger: Mechanical grooved couplings, ductile iron housing clamps, lock "C" shaped composition gasket, steel bolts, nuts, and washers.
      c. Coupling and fittings shall be made by the same manufacturer.

2.02 BALL VALVES

A. Manufacturers:
   1. NIBCO
   2. Apollo
   3. Engineer approved equal.

B. Up To and Including 2 Inches: Bronze two piece body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, threaded ends, full port on 1” and smaller, standard port above 1”.

C. UL listed and FM approved for fire protection service.

2.03 BUTTERFLY VALVES

A. Manufacturers:
   1. Victaulic
   2. Tyco
   3. NIBCO
   4. Milwaukee
   5. Engineer approved equal.

B. Two Inch (2”) and Smaller: Bronze one piece body, full port, stainless steel disc, EPDM seat, threaded ends, hand wheel and gear drive with integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

C. Over 2 Inches: Ductile iron body, nickel plated ductile iron disc, resilient replaceable EPDM seat, groove ends, extended neck, hand wheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

D. UL listed and FM approved for fire protection service.

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. See plumbing specifications for underground piping requirements.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space and to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

G. Prepare pipe, fittings, supports and accessories for finish painting. Where pipe support members are welded to structural building frame, scrape, brush clean and apply one coat of zinc rich primer to welding.

H. Do not penetrate building structural members unless indicated.

I. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J. Die cut screw 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.

K. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

L. Provide butterfly valves for shut-off or isolating service.

M. Provide drain valves at main shut-off valves, low points of piping and apparatus.

N. Run drain piping to suitable drainage point, interior to the building. Coordinate all locations with architect.

O. Route piping concealed above ceiling. Where piping has to be exposed, coordinate all pipe routing with the architect.

END OF SECTION 21 12 00

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sprinkler heads

B. Flexible sprinkler head connection assembly

C. Piping specialties

D. Dual check backflow preventer

1.02 RELATED SECTIONS

A. Specification Section 21 12 00 - Fire Suppression Piping

1.03 REFERENCES

A. NFPA 13 - Installation of Sprinkler Systems

B. NFPA 15 - Water Spray Fixed Systems for Fire Protection

C. NFPA 231 - Standard for General Storage

D. NFPA 231C - Standard for Rack Storage of Materials

E. FM - Factory Mutual Approval Guide

F. NFPA 70 - National Electrical Code

G. UL - Fire Resistance Directory

H. UL 199 - Automatic Sprinklers

I. Warnock Hersey - Certification Listings

1.04 SYSTEM DESCRIPTION

A. Provide system as specified in Section 21 0050.

B. Flow test data included in the contract documents is for bidding purposes only. The contractor shall complete a flow test to determine the available volume and associated pressure of the incoming water supply to the building's sprinkler system. The contractor shall utilize their test data to complete all design calculations as required per these specifications. The contractor's flow test data shall be submitted to the Architect/Engineer for informational purposes prior to submitting any other Division 21 submittals.

C. Interface system with building fire and smoke alarm system.

D. Provide fire department connections where required.

1.05 SUBMITTALS

A. Product Data: Provide manufacturers catalog data including load capacity.

B. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.06 PROJECT RECORD DOCUMENTS

A. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation.

B. Shop Drawings: Indicate hydraulic calculations, detailed pipe lay out, hangers and supports, components and accessories. Indicate system controls.

C. 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.

D. Submit shop drawings, product data and hydraulic calculations to the local fire marshal and owner's insurance underwriter for approval. Submit proof of approval to architect and engineer.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.

1.07 AS BUILT DRAWINGS

A. Record actual locations of sprinkler heads and deviations of piping from the drawings. Indicate drain and test locations.

1.08 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers, availability and location of service depot.

1.09 QUALITY ASSURANCE

A. Perform work in accordance with the System Description in Section 21 0050 where applicable and pre-approved by State Fire Marshal.

B. Equipment and components shall bear UL and FM label or markings.

C. Maintain one copy of document on site.

1.10 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with a minimum of three years experience.

1.11 REGULATORY REQUIREMENTS

A. Hydraulic Calculations, Product Data and Shop Drawings:
   1. Bear stamp of approval of authority having jurisdiction.
   2. Submit to the State of Iowa and to the owner's insurance underwriter.

1.12 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, and protect products to site.

B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.13 EXTRA MATERIALS

A. Provide extra sprinkler heads under provisions of NFPA 13.

B. Provide suitable wrenches for each head type.

C. Provide metal storage cabinet in location designated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Viking

B. Reliable

C. Tyco

D. Engineer approved equal.

2.02 SPRINKLER HEADS

A. Concealed Ceiling Type:
   1. Concealed drop-down type with matching removable ceiling cover plate.
   2. Head finish: Brass.
      a. Ceiling Cover Plate Finish: Factory finish, architect to select. Provide color chart.

B. Exposed Area Type:
   1. Type: Standard upright type with guard.
   2. Finish: Brass
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Side Wall Type:
   1. Type: Recessed horizontal sidewall type with matching screw on escutcheon plate.
   2. Head Finish: Enamel, color white.
   3. Escutcheon Plate Finish: Enamel, color white.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler head, install where heads are subject to damage.

E. Early Suppression Fast Response Type (ESFR):
   1. Type #ESFR pendant with heavy discharge.
   2. Finish: Brass
   3. Fusible Link: Fast-response link design.

F. Dry Pendent
   1. Type: Dry pendent designed for freezing and supplied from a wet system in an adjacent heated area.
   2. Finish: Brass
   3. Provide with insulating boot assembly.

2.03 FLEXIBLE SPRINKLER HEAD CONNECTION ASSEMBLY

A. Corrugated stainless steel hose with threaded end fittings and adjustable mounting bracket.

B. UL listed and FM approved for fire protection service.

C. Flame spread index of 25 or less and smoke developed index of 50 or less per ASTM E84.

D. Ambient temperature rating: 300°F.F. Pressure rating: 175 psi.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically operated alarms with pressure retard chamber and variable pressure trim.

B. Exterior Horn/Strobe: Mount directly above fire department connection. Coordinate electrical requirements with the electrical contractor.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical with two contacts rated 10 amp at 115 volt AC. Switch shall have adjustable time delay feature. Include wiring of flow switch to fire alarm panel.

D. Fire Department Connections (Verify with local fire department):
   1. Type: Flush mounted wall type with brass finish.
   2. Outlet: One way with thread size to suite fire department hardware, threaded dust cap and chain of matching material and finish. Verify with local fire department threads required.
   3. Drain: 3/4 inch automatic drip, connected to drain.
   4. Label: "Sprinkler - Fire Department Connection".
   5. Provide storz device as required.

E. Provide tamper switches on all valves.

2.05 DUAL CHECK VALVE BACK FLOW PREVENTER

A. Manufacturers:
   1. Watts #757
   2. Conbraco
   3. Febco
   4. Hersey-Beeco
   5. Ames
   6. Engineer approved equal.

B. ANSI/ASSE 1015; stainless steel body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

C. Conform to USC standards.

D. Assembly shall include two isolation valves USC approved.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Install buried shut-off valves in valve box. Provide post indicator with tamper switch. Coordinate location with local fire department

C. Provide approved double check valve assembly at sprinkler system water source connection. Verify with local fire marshal prior to bid.

D. Locate fire department connection with sufficient clearance from walls, obstructions or adjacent Siamese connectors to allow full swing of fire department wrench handle.

E. Locate exterior horn/strobe alarm directly above fire department connection.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Center heads in two directions in ceiling tile and provide piping offsets as required.

I. Apply masking tape or paper cover to protect concealed sprinkler heads. Neither cover plates nor sprinkler heads receive field paint finish.

J. Flush entire piping system of foreign matter.

K. Hydrostatically test entire system including piping from the post indicator valve to the building. All piping associated with the automatic fire sprinkler system shall be tested by the Division 21 contractor.

L. Require test be witnessed by authority having jurisdiction.

M. Adjust concealed head sprinkler plate snug to ceilings.

N. Install all zone flow switches as called for on the drawings or as required. Extend fire department test connections to above floor drain or building exterior as approved by the local inspector.

O. Coordinate all head locations with mechanical/electrical systems as well as architectural drawings.

P. A sprinkler head shall be put on both sides of a privacy curtain. The exception in NFPA 13 for mesh at the top of a curtain shall not be used.

Q. Coordinate all exposed pipe routing and drain valve locations with architect prior to installation.

R. Install a high temperature sprinkler head in the kiln hood ductwork in accordance to AHJ requirements.

S. Mechanical contractor shall furnish and install post indicator valve and tamper switch. Fire alarm and electrical contractors shall furnish and install wiring and conduit to the tamper switch.

T. Flexible sprinkler head connection hose length shall be selected as appropriate for distance from branch line to sprinkler head. Maintain manufacturer's requirements for minimum radius and maximum quantity of bends. Sprinkler hose and sprinkler head shall be properly clamped and secured. Installation shall satisfy manufacturer installation requirements, UL and FM requirements. Where the requirements differ, the more stringent requirement applies.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION 21 13 00

SECTION 22 00 50

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Plumbing Requirements specifically applicable to Mechanical Division Specification Sections.

B. Division 22 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 WORK BY OWNER

A. The Following Work or Sub Contracts Will Be Supplied and Furnished By The Owner:
   1. Fluids equipment and accessories including associated pumps, piping, hose reels.

B. The Following Products Will Be Furnished By The Owner:
   1. Air compressor and associated piping and accessories.

C. Owner's Responsibility:
   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.

D. Contractor's Responsibility:
   1. Review owner reviewed shop drawings, product data and samples.
   2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
   3. Handle, store, install and finish products. Install electrical wiring and devices.
   4. Repair and/or replace items damaged after receipt.

1.03 OWNER OCCUPANCY

A. The owner will occupy the premises during the construction period.

B. Limit use of site and premises to allow owner occupancy.

C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

D. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by themselves, by their employees or through any operation under their charge, whether in the contract or extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:
   1. The National Board of Fire Underwriters
   2. The American Gas Association

3. The National Fire Protection Association (NFPA)
4. The Occupations Safety and Health Act (OSHA)
5. Current IBC Building Code
6. Current applicable city building codes

F. Mechanical: Conform to current mechanical code.

G. Plumbing: Conform to current plumbing code.

H. Obtain permits and request inspections from authority having jurisdiction.

I. Safe Drinking Water Act and Senate Bill S.3874: All products must meet the lead-free requirements of the SDWA and NSF/ANSI 372 certification.

1.05 PROJECT/SITE CONDITIONS

A. Install work in locations shown on the drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.

C. This contractor, before submitting their bid, shall visit the site of the project to familiarize themselves with locations and conditions affecting their work.

D. It is the intent of this specification that the contractor furnishes all labor and material required completing the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing piping, ductwork, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.

F. This contractor shall provide holes as necessary for the installation of their work and in accordance with other specification sections in materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to ensure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction, this contractor shall check and verify with the owner each item of existing equipment that must be removed.

B. The owner will designate which items of material or equipment not reused that they may wish to keep. This contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for their use shall become the property of the contractor and shall be removed from site.

1.10 PROTECTION AND MAINTENANCE

A. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

B. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

C. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of their work.

D. Coordinate protection requirements with department heads before beginning construction.

E. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 DEMOLITION

A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.
   4. All elements to be removed are subject to the Owner's Right of Salvage.

B. Preserve services to the existing facility. Extend/reroute/reconnect existing systems as required providing for the continued function of these systems.

1.12 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of their work in all existing and new buildings unless otherwise noted.

B. This contractor shall arrange for openings in the building as required for the installation of equipment furnished under this contract.

C. Where sewers must be extended or changed, patching with concrete will be done in the building. Patching shall be at both the top and bottom of sleeves where above grade.

D. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, contractor shall be responsible to patch and/or seal openings as necessary to maintain/return fire separation to rating as required by applicable codes.

E. This contractor shall do all cutting and patching required for their work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

A. The Contractor shall coordinate with the owner special cleaning requirements and acceptable routes for transporting building material and rubbish removal.

B. Hazardous waste shall not be disposed of using sanitary or storm drains, or owner's waste disposal facilities. Hazardous waste shall be removed from the project site and lawfully disposed

C. of at the contractor's expense.

D. Daily Requirements:
   1. The Contractor shall maintain the work area each day to prevent hazardous accumulation of waste from the work site.
   2. At the end of each working day, the contractor shall remove all their debris, rubbish, tools, and surplus materials from the project work area. The work area shall appear broom clean and left in a neat and orderly condition. The contractor for the removal of debris from the project shall not use the owner's waste disposal facilities.
   3. All equipment shall be cleaned, and the premises left in excellent condition, free of dirt, debris, dust, grease, oil.

E. End of Project Requirements:
   1. The Contractor, upon completion of their work, shall remove all rubbish and debris resulting from their operation and shall remove it from site at their own expense.
   2. At the end of construction, all equipment and surfaces in the project area shall be left in a clean condition. Except for protective coatings and surfaces, equipment shall be cleaned to be free of dirt, dust, debris, oil, and grease. Fingerprints, palmprints, and footprints shall be cleaned from visible surfaces. Equipment rooms shall have surfaces cleaned, floor shall be broom clean and mopped. Spaces that are to be occupied within the work area shall have all surfaces dusted, cleaned, and disinfected. Floors shall be vacuum cleaned and mopped (if applicable).

1.14 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
   1. Dow Corning "Silicone RTV Foam"
   2. 3-M Corporation "Fire Barrier Caulk and Putty"
   3. Thomas & Betts "Flame Safe Fire Stop System"

D. Installation of these products to be in strict accordance with manufacturer's recommendations and architectural specification sections or equivalent fire stopping architectural specification section.

E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 ELECTRICAL CONNECTIONS

A. This contractor shall turn over all magnetic starters, thermal protective switches and speed changing switches furnished under this contract for all motor driven equipment to the electrical contractor who will install such starters and switches and wire them to their respective motors as a part of the electrical contract.

1.16 UTILITY COMPANY

A. Any fees by the utility company are to be billed directly to the owner.

B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.17 HAZARDOUS MATERIALS

A. If the contractor stores any hazardous solvents or other materials on the site, they shall obtain copies of the safety data sheets for the materials and post them on the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.
   1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.18 RECORD DRAWINGS

A. This contractor shall provide, at the conclusion of the project, one clean, non-torn, neat, and legible "as-built" set of drawings to the owner. These drawings shall show the routing of pipes, ductwork and equipment drawn in at scaled locations. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.

B. All mechanical systems installed shall be shown on the "as-built" drawings.

C. Refer to respective architectural specification section for additional information.

D. This contractor shall update these drawings during the project at least every week.

1.19 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer for review one (1) electronic copy of a brochure giving a complete list of materials and equipment they propose to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions and illustration. One of the returned copies shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless the contractor notifies engineer in writing of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set that they have checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.20 SCOPE OF WORK

A. All work shall be performed by well-qualified and licensed mechanics with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their mechanics are familiar with all the various codes and tests applicable to this work.

B. All equipment shall be new and of the type as specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

C. The intent of the drawings and specifications is for complete installation of the systems outlined in the drawings and specifications so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.

D. This contractor shall be required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The drawings and specifications cannot deal individually with the many minute items that may be required by the nature of the systems.

E. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

F. The Plumbing Contractor shall establish system elevations prior to fabrication and installation. The Plumbing Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate.
   3. Electrical bus duct.
   4. Sheet metal.
   5. Cable trays, including access space.
   6. Other piping.
   7. Conduits and wireway.

1.21 VERIFICATION OF ELEVATION OF EXISTING LINES

A. This contractor, before starting any new work, shall verify the elevations of all existing piping to which they must connect under this contract. The contractor shall report any discrepancies between drawing elevations and actual elevations to the engineer before proceeding with the work. Failure of the contractor to do so shall make them liable for the cost of extra work involved.

1.22 WELDING PERMIT

A. Form titled "Permit For Cutting and Welding With Portable, Gas or Arch Equipment" must be completed and returned to the hospitals designated representative prior to work commencing. The owner upon request will supply this form.

1.23 CLEANING OF MECHANICAL SYSTEMS

A. The mechanical contractor shall clean and passivate all plumbing systems. Flush systems with water until free from all sand, grit, gravel, oil, etc. Provide Babcock/Wilcox Millipore and biological testing on the flush water. The flush will be considered a success when the water exiting the system contains less than 100 ppb of total suspended solids and less than 100 RLUs.

B. Where connections are made to existing piping systems, this contractor shall provide isolation valves, threaded tees, etc., as required to facilitate the cleaning and testing of all new piping.

C. This contractor shall thoroughly clean all rust, grease, plaster, cement, etc., from all equipment and piping furnished and installed by them as required to leave surfaces suitable for finish painting.

D. This contractor shall keep all pipes, traps, waste lines, ducts, etc., plugged, drained or otherwise protected during construction. All items of mechanical equipment shall be suitably protected and upon completion of project shall be equal to new condition.

1.24 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. All underground utilities, piping, etc shall be located exactly before digging. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional requirements.

1.25 ALTERNATES

A. Refer to General Specification Sections for alternate bid description.

1.26 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 22 00 50

SECTION 22 00 90

MINOR PLUMBING DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 22 00 50 - Basic Mechanical Requirements "General Provisions" apply to this section.

1.02 SCOPE

A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.

B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.

C. This contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.

D. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.

E. This contractor shall remove all abandon equipment, piping, ductwork, supports, equipment curbs, and bases associated with the remodeled areas unless noted otherwise.

F. This contractor is responsible to provide temporary plumbing protection during this project.

1.03 MATERIALS

A. All elements to be removed are subject to the Owner's Right of Salvage.

B. All materials removed shall be the property of the removing contractor and shall be removed from the site by them, unless otherwise specified.

C. The owner may designate and have salvage rights to any material herein demolished by this contractor. The contractor shall coordinate with the owner prior to start of demolition.

1.04 WORK BY OTHERS

A. Unless specifically noted under other contracts, this mechanical contractor shall assume they will perform all required work. In general, the following will be performed by others:
   1. The electrical contractor will disconnect all electrical service and remove conduit back to behind finished surfaces, close and cap ends of conduits.

1.05 EXISTING CONDITIONS

A. If any piping serving existing fixtures or equipment (that are to remain) are disturbed by operations under this contract, this contractor shall provide pipe and insulation required to re-establish continuity of such piping systems.

B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to the removal of equipment, piping, and ductwork.

C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.

D. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 22 00 90

SECTION 22 05 16

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe connectors

B. Copper piping

C. Expansion joints

D. Accessories

1.02 RELATED SECTIONS

A. Specification Section 22 11 16 - Domestic Plumbing Piping

1.03 REFERENCES

A. MIL-E-17814E - Expansion Joints, Pipe, Slip-Type, Packed

B. NSF/ANSI 61 - Drinking Water System Components - Health Effects

C. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.04 PERFORMANCE REQUIREMENTS

A. Provide structural work and equipment required controlling the expansion and contraction of piping. Verify that the anchors, guides, and expansion joints provided, adequately protect the system.

B. Expansion Calculations:
   1. Installation Temperature: 50 deg F.
   2. Hot Water Heating: 210 deg F.
   3. Domestic Hot Water: 140 deg F.
   4. Safety Factor: 30 percent

1.05 SUBMITTALS

A. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure and total number of wires in braid.
   2. Expansion Joints: Indicate temperature and pressure rating, and maximum expansion compensation.
   3. Design Data: Indicate selection calculations.

B. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.

1.06 PROJECT RECORD DOCUMENTS

A. Record actual locations of flexible pipe connectors, expansion joints, anchors, and guides.

1.07 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include adjustment instructions.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to the site.

B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.10 WARRANTY

A. Provide a one-year warranty under provisions of Architectural Specification Sections.

B. Warranty: Include coverage for leak free performance of packed expansion joints.

1.11 REGULATORY REQUIREMENTS

A. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS

A. Steel Piping:
   1. Manufacturers:
      a. Metra Flex
      b. Mason Industries
      c. Minnesota Flexible
      d. Engineer approved equal.

B. Inner Hose: Stainless steel.

C. Exterior Sleeve: Single braided stainless steel.

D. Pressure Rating: 125 psig WSP and 450 deg F.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum Offset: 3/4 inch on each side of installed centerline.

H. Copper Piping:
   1. Manufacturers:
      a. Mason Industries
      b. Metra Flex
      c. Minnesota Flexible
      d. Engineer approved equal.
   2. Inner Hose: Bronze
   3. Exterior Sleeve: Braided bronze.
   4. Pressure Rating: 125 psig WSP and 450 deg F.
   5. Joint: As specified for pipe joints.
   6. Size: Use pipe-sized units.
   7. Maximum Offset: 3/4 inch on each side of installed centerline.

2.02 EXPANSION JOINTS

A. Stainless Steel Bellows Internally Guided Type:
   1. Manufacturers:
      a. Hyspan
      b. Metra Flex
      c. Engineer approved equal.
   2. Bellows Pressure Rating: 150 psig WSP and 850 deg F.
   3. Maximum Compression: Six inches.
   4. Maximum Extension: Two inches.
   5. Joint: Flanged 3500 series with gasket.
   6. Size: Use pipe-sized units.
   7. Application: Steel piping two inch (2") and over.
   8. Use single fixed flanged type #3501 or fixed flanged dual with an anchor base type #3505 as noted on the drawings.

B. Stainless Steel Bellows External Ring Controlled Type:
   1. Manufacturers:
      a. Metra Flex
      b. Hyspan
      c. Engineer approved equal.
   2. Bellows Pressure Rating: 300 psig WSP and 500 deg F.
   3. Maximum Compression: 4-7/8 inches.
   4. Maximum Extension: 3/8 inch.
   5. Maximum Offset: 1/8 inch.
   6. Joint: Flanged
   7. Size: Use pipe-sized units.
   8. Accessories: Internal stainless steel flow liner.
   9. Application: Steel piping over three inches.

2.03 ACCESSORIES

A. Pipe Alignment Guides:
   1. Manufacturers:
      a. Hyspan
      b. Metra Flex
      c. Engineer approved equal.
   2. Two piece welded steel with enamel paint, bolted with spider to fit standard pipe, frame with four mounting holes, clearance for minimum two inch (2") thick insulation, minimum three inch (3") travel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Construct spool pieces to exact size of flexible connection for future insertion.

C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors. Base mounted equipment including pumps use double sphere flex.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required controlling expansion and contraction of piping. Provide loops, pipe offsets and swing joints or expansion joints where required or indicated.

G. Provide Victaulic piping with minimum one joint per inch pipe diameter instead of flexible connector supported by vibration isolation. Victaulic piping need not be anchored.

H. Provide expansion loops or expansion joints as indicated on the drawings.

I. Use external ring expansion joints with pipe guides on steam and condensate piping in the basement and tunnels.

3.02 MANUFACTURER'S FIELD SERVICES

A. Provide inspection services by flexible pipe manufacturer's representative for final installing and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION 22 05 16

SECTION 22 05 19
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges
B. Pressure gauge tappings
C. Stem type thermometers
D. Dial thermometers
E. Thermometer supports
F. Test plugs

1.02 REFERENCES

A. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element
B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi
C. ASTM E1 - Standard Specification for ASTM Thermometers
D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers
E. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case
F. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service
G. AWWA C702 - Cold-Water Meters - Compound Type
H. AWWA C703 - Cold-Water Meters - Fire-Service Type
I. AWWA C706 - Direct-Reading Remote-Registration Systems for Cold-Water Meters
J. AWWA C710 - Cold-Water Meters - Displacement Type, Plastic Main Case
K. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance
L. UL 393 - Indicating Pressure Gauges for Fire-Protection Service
M. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service
N. NSF/ANSI 61 - Drinking Water System Components - Health Effects
O. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.03 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data, indicating use, operating range, total range, accuracy, and location for manufactured components.
C. Closeout submittal
    1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Operation and Maintenance Information, including calibration instructions
D. Project Record Documents
    1. Final installed locations of all components on a PDF floor plan

1.04 ENVIRONMENTAL REQUIREMENTS

A. Do not install instruments when areas are under construction, except for required rough in, taps, support, and test plugs.

1.05 REGULATORY REQUIREMENTS

A. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Ametek/US Gauge Series
   2. Trerice
   3. Miljoco - Weiss
   4. Weiss Instruments
   5. Dwyer
   6. Winters Instruments
   7. Engineer approved equal.

B. Gauge: Install where indicated on the drawings, 4.5 inch dial size pressure gauge, phenolic solid front pressure relieving case, Grade 1A, +/- 1% accuracy with range approximately twice working pressure.

C. All gauges to be fitted with gauge cocks.

2.02 PRESSURE GAUGE TAPPINGS

A. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.

B. Ball Valve: Brass 1/4 inch NPT for 250 psi.

C. Pulsation Damper: Pressure snubber brass with 1/4 inch NPT connections.

D. Siphon: Steel, Schedule 40, 1/4 inch NPT angle or straight pattern.

2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Miljoco-Weiss
   2. Trerice
   3. Engineer approved equal.

B. Thermometer: ASTM E1, blue organic-filled glass tube, lens front tube, cast aluminum case with enamel finish.

C. Size: Six inch (6") scale where less than six foot (6') above floor, nine inch (9") scale where higher than six inch (6") above floor.

D. Window: Polyester/glass mixture or acrylic.

E. Stem: Aluminum, 3/4 inch NPT, 3-1/2 inch

F. Accuracy: Two percent.

G. Range: Approximately 20% greater than expected operating temperature.

H. Calibration: Degree F.

I. Accessories: Manufacturer's 3-1/2 inch stem lead-free thermowell.

2.04 DIAL THERMOMETERS

A. Manufacturers:
   1. Miljoco-Weiss
   2. Trerice
   3. Winters Instruments.
   4. Engineer approved equal.

B. Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem and variable angle face.

C. Size: Three inch diameter dial.

D. Lens: Clear glass.

E. Accuracy: One percent.

F. Range: Approximately 20% greater than expected operating temperature.

G. Calibration: Degree F.

H. Accessories: Manufacturer's lead-free thermowell.

2.05 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stem with or without extensions as required.

2.06 TEST PLUGS

A. Test Plug: Brass 1/4 inch fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 deg F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install one pressure gauge per pump with taps before strainers and on suction and discharge of pump; pipe to gauge.

B. Install gauge taps in piping.

C. Install pressure gauges with pulsation dampers. Provide ball valve to isolate each gauge. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Coil and conceal excess capillary on remote element instruments.

F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degree off vertical.

G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

H. Locate test plugs adjacent thermometers and thermometer sockets adjacent to pressure gauges and pressure gauge taps.

I. Refer to schematics and details on drawings for additional locations.

3.02 SCHEDULES

A. See details on drawings.

END OF SECTION 22 05 19

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers and supports
B. Accessories
C. Flashing
D. Equipment bases
E. Sleeves

1.02 RELATED SECTIONS

A. Specification Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment
B. Specification Section 22 11 16 - Domestic Water Piping

1.03 REFERENCES

A. ASME B31.9 - Building Services Piping
B. ASTM F708 - Design and Installation of Rigid Pipe Hangers
C. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer
D. MSS SP69 - Pipe Hangers and Supports - Selection and Application
E. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data
        b. Design Data, indicating load capacity of hangers

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
    1. Anvil International
    2. Tolco/Cooper B-Line
    3. Engineer approved equal.
B. Plumbing Piping - Drain, Waste and Vent:
    1. Conform to ASME B31.9; ASTM F708
    2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inch: Carbon steel adjustable swivel, split ring.
    3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
    4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
    5. Wall Support for Pipe Sizes to 3 Inches: Cast iron bracket.

6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, and copper plated.
10. Provide zinc coated hangers and supports for all non air conditioned areas.
11. Provide stainless steel hangers and supports in locker rooms and other high humidity area.
12. Provide zinc coated (hot dipped galvanized) hangers and supports for all exterior applications.

C. Plumbing Piping - Water:
1. Conform to ASME B31.9; ASTM F708.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel adjustable swivel, split ring. Anvil International Figure 104.
3. Hangers for Cold Pipe Sizes 2 Inch and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inch to 4 Inch: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inch and Over: Adjustable steel yoke, cast iron roll, single hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron bracket.
9. Wall Support for Pipe Sizes 4 Inches Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
16. Provide zinc coated hangers and supports for all non air conditioned areas.
17. Provide stainless steel hangers and supports in locker rooms and other high humidity area.
18. Provide zinc coated (hot dipped galvanized) hangers and supports for all exterior applications.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end or continuous threaded.

2.03 FLASHING

A. Metal Flashing: 26 gauge galvanized steel.

B. Metal Counter Flashing: 22 gauge galvanized steel.

C. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.04 EQUIPMENT BASES

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond supported equipment.

2.05 SLEEVES

A. Sleeves for pipes through wall below grade shall be Schedule 40, two pipe diameters larger than pipe. Seal with Linkseal.

B. Sleeves for pipes through non-fire rated floors shall be 18 gauge galvanized steel.

C. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors shall be Schedule 40 steel pipe or 18 gauge galvanized steel.

D. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing to be a fire rated sleeve assembly including seals, UL listed.

E. Stuffing and Firestopping Insulation: Fiberglass type, non-combustible per UL tested assembly type.

F. Sealant Manufacturers:
   1. Dow Corning Silicone RTV Foam.
   2. 3-M Fire Barrier Caulk and Putty.
   3. Thomas & Betts Flame Safe Fire Stop System.
   4. Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inch of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub with 5 foot maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond all floor supported equipment.

B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting three inch (3") minimum above finished roof surface with 24" x 24" sheet size. Turn flanges back into wall and caulk, metal counterflash, and seal for pipes through outside walls. Refer to architectural drawings and specifications for additional information.

C. Flash floor drains in floors with topping over finished areas with waterproof membrane ten inch (10") clear on sides with minimum 36" x 36" sheet size. Fasten flashing to drain clamp device.

D. Seal floor, shower, and mop sink drains watertight to adjacent materials.

E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floor one inch above finished floor level. Caulk sleeves.

D. Provide sleeves where piping penetrates floor, ceiling or wall fire rated assemblies. Close off space between pipe and adjacent work with fire stopping insulation and caulk.

E. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install chrome plated steel escutcheons at finished surfaces and within cabinets.

3.06 SCHEDULES

HANGER ROD PIPE SIZE	MAX. HANGER SPACING FEET	DIAMETER INCHES
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 to 6	10.0	5/8
8 to 12	14.0	7/8
14 and Over	20.0	1
PVC (all sizes)	6.0	3/8
C.I. Bell & Spigot (or No-Hub) and at Joints	5.0	5/8

END OF SECTION 22 05 29

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates

B. Tags

C. Pipe markers

D. Labels

E. Schedule

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data, including a list of wording, symbols, letter size, and color-coding for mechanical identification.

C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Project Record Documents
   1. Record actual locations of tagged valves, including valve tag numbers.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 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. Information Tags: Clear plastic with printed "Danger, "Caution" or "Warning" and message; size 3-1/4" x 5-5/8" with grommet and self-locking nylon ties.

D. Tag Chart: Typewritten letter size list in anodized aluminum frame plastic laminated.

2.03 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6" W x 4" mil thick, manufactured for direct burial service.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating flow direction arrow and identification of fluid being conveyed.

2.04 LABELS

A. Description: Laminated Mylar, size 1.9" x 0.75" adhesive backed with printed identification.

PART 3 EXECUTION

3.01 PREPARATION

A. De-grease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners or adhesive.

C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. Apply paint primer before applying labels for unfinished canvas covering.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Install underground plastic pipe markers six inch (6") to eight inch (8") below finished grade, directly above buried pipe.

F. Tag automatic controls, instruments, and relays. Key to control schematic.

G. Identify piping, concealed or exposed as indicated in schedule below. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 foot on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction. Identify on both sides of any wall.

H. Conform to owner's existing identification scheme. Verify with owner prior to bid.

3.03 IDENTIFICATION SCHEDULE

COMPONENT	IDENTIFICATION
Plumbing Equipment (softener, Water Heater, etc.)	Plastic Nameplates
Pumps (1 HP and Above)	Plastic Nameplates
Pumps (Below 1 HP)	Tags
All Valves	Tags
Control Panels and Other Major Control Components	Plastic Nameplates
Automatic Controls, Instruments, Relays	Tags
Piping (Larger than 3/4")	Plastic Tape Pipe Markers
Piping (3/4” and Smaller)	Plastic Tape Pipe Markers

END OF SECTION 22 05 53

SECTION 22 07 19
DOMESTIC PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass

B. Flexible elastomeric foam insulation

C. Jackets

1.02 RELATED SECTIONS

A. Specification Section 22 05 53 - Identification for Plumbing Piping and Equipment

1.03 REFERENCES

A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement

E. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block

F. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement

G. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation

I. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

J. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation

K. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation

L. ASTM C578 - Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation

M. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation

N. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation

O. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

P. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

Q. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

R. ASTM D1667 - Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers

S. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

T. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics

U. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

V. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

W. NAIMA National Insulation Standards

X. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density and thickness.

1.08 ENVIRONMENTAL REQUIREMENTS

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 FIBERGLASS

A. Manufacturers:
   1. Johns Manville Micro-Lok HP
   2. Owens Corning
   3. Knauff
   4. Engineer approved equal.

B. Insulation: ASTM C547 rigid molded, noncombustible.

C. "K" Value: ASTM C335, 0.23 at 75 deg F.

D. Minimum Service Temperature: 0 deg F.

E. Maximum Service Temperature: 800 deg F.

F. Maximum Moisture Absorption: <5% by weight.

G. Vapor Barrier Jacket: ASTM C1136, white Kraft paper with fiberglass yarn, bonded to aluminized film.

H. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.

I. Secure with self-sealing longitudinal laps and butt strips.

J. Surface Burning: ASTM E84; Flame Spread-25, Smoke Developed-50

K. VOC Content: ASTM D5116; 0.15 g/l

2.02 FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Manufacturers:
   1. Armacell: AP Armaflex
   2. Aerocel
   3. K-flex
   4. Engineer approved equal.

B. Insulation: ASTM C534 flexible cellular elastomeric molded sheet.

C. "K" Value: ASTM C177 or C518; 0.27 at 75 deg F.

D. Minimum Service Temperature: -40 deg F.

E. Maximum Service Temperature: 220 deg F.

F. Maximum Moisture Absorption: ASTM D1056, 5.0% by weight gain.

G. Maximum Water Vapor Permeability: ASTM E96; 0.05 perm-in.

H. Maximum Flame Spread: ASTM E84; 25

I. Maximum Smoke Developed: ASTM E84; 50

J. Insulated Pipe Hangers: Refer to the requirements for elastomeric insulation contained in the Inserts and Shields portion of this section.

K. Elastomeric Foam Adhesive:
   1. Manufacturers:
      a. Armstrong #BLV 520
      b. Aeroflex
      c. Halstead/K-Flex
      d. Engineer approved equal.
   2. Air-dried contact adhesive, compatible with insulation.
   3. VOC Content: 0 g/L as calculated and reported by SCAQMD 1168.

2.03 JACKETS

A. PVC Plastic:
   1. Manufacturers:
      a. Johns Manville Zeston
      b. Owens Corning
      c. PIC Plastics
      d. Engineer approved equal.
   2. Jacket: ASTM C921, UV resistant, one piece molded type fitting covers and sheet material, off white color.
   3. Minimum Service Temperature: 0 deg F.
   4. Maximum Service Temperature: 150 deg F.
   5. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
   6. Maximum Flame Spread: ASTM E84; 25
   7. Maximum Smoke Developed: ASTM E84; 50
   8. Thickness: 20 mil.
   9. Connections: Brush on welding adhesive.

B. Covering Adhesive Mastic:
   1. Manufacturers:
      a. Johns Manville Perma-Weld
      b. PIC Plastics
      c. Engineer approved equal.
   2. Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry with foreign material removed.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Dual Temperature Pipes or Cold Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory applied or field applied.
   2. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe.
   3. Provide PVC fitting covers.
   4. Continue insulation through walls (unless in firewall sleeves), pipe hangers and other pipe penetrations.
   5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
   6. Vapor seal insulation ends every 20 feet.

D. Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets with vapor barrier, factory applied.
   2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe.
   3. Provide PVC fitting covers.
   4. Continue insulation through walls (unless in firewall sleeves) pipe hangers and other pipe penetrations.

E. Inserts and Shields:
   1. Manufacturers:
      a. Jeff Company/Buckaroo
      b. Amacell
      c. Cooper/Eaton
      d. TPS
      e. Engineer approved equal.
   2. Shields: Galvanized saddle with flared edges between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the vapor barrier and finish jacket.
   4. Insert Configuration: Minimum six inch (6") long of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Type:
      a. Polystyrene and Fiberglass Insulation: 360 degree polyisocyanurate or phenolic foam cylindrical insert capable of supporting piping system. Pre-fabricated, insulated and jacketed supports are acceptable. Blocks, plugs, or wood material are not acceptable.
      b. Flexible Elastomeric Foam Insulation: Pre-fabricated 360 degree insulated pipe hanger with polyethylene inserts (Armacell "Armafix" or equal). Match thickness of pipe insulation. Hanger shall have PVC or aluminum jacket. Provide friction tape on inside of pipe clamp/support to avoid slipping.

F. Insulation shall be continuous at all hangers. Hanger shall not be in direct contact with pipe.

G. Insulation on piping served by heat trace shall be sized large enough to enclose the pipe and the heat wire.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10% at normal conditions, as materials indicate.

3.04 SCHEDULE

FIBERGLASS INSULATION

PIPING SYSTEMS	PIPE SIZE	THICKNESS
Domestic Hot Water and Re-Circulation	Less than 1.5"	1"
Domestic Hot Water and Re-Circulation	1.5" and Larger	1.5"
Plumbing Vents within 10' of Exterior	All	1"
Domestic Cold Water	All	1"
Condensate Drain from Cooling Coil	All	1"
PVC Piping Installed in a Return Air Plenums (including Mechanical Rooms)	All	1.5"

FLEXIBLE ELASTOMERIC FOAM INSULATION

PIPING SYSTEMS	PIPE SIZE	THICKNESS
Domestic Hot Water and Re-Circulation	Less than 1.5"	1"
Domestic Hot Water and Re-Circulation	1.5" and Larger	1.5"
Plumbing Vents Within 10' of Exterior	All	3/4"
Domestic Cold Water	All	3/4"

PIPE JACKET SCHEDULE

PIPE LOCATION	JACKET MATERIAL
Piping in Mechanical/Electrical/Storage Room within 10' of floor (excluding racked piping)	PVC

END OF SECTION 22 07 19

SECTION 22 11 16
DOMESTIC PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewer piping (below grade)
B. Sanitary sewer piping (above grade)
C. Fire protection water service (below grade)
D. Water piping (below grade)
E. Water piping (above grade)
F. Water piping (press fittings)
G. Storm water piping (below grade)
H. Storm water piping (above grade)
I. Ball valves
J. Butterfly valves
K. Spring loaded check valves
L. Relief valves
M. Strainers
N. Fire stop systems
O. Drain ball valves
P. Pipe accessories
Q. Post indicator valve
R. Equipment drains and overflows

1.02 RELATED SECTIONS

A. Specification Section 22 05 53 - Identification for Plumbing Piping and Equipment

1.03 REFERENCES

A. ASME B31.1 - Power Piping
B. ASME B31.9 - Building Service Piping
C. ASME Section 9 - Welding and Brazing Qualifications
D. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800
E. ASME B16.3 - Malleable Iron Threaded Fittings
F. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250
G. ASME B16.18 - Cast Bronze Solder - Joint Pressure Fittings
H. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
I. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings – DWV
J. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes
K. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV
L. ASME B16.32 - Cast Copper Alloy Solder-Joint Fittings for Solvent Drainage Systems
M. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
N. ASTM A74 - Cast Iron Soil Pipe and Fittings
O. ASTM B32 - Solder Metal
P. ASTM B43 - Seamless Red Brass Pipe

Q. ASTM B88 - Seamless Copper Water Tube
R. ASTM B306 - Copper Drainage Tube (DWV)
S. ASTM C14 - Concrete Sewer, Storm Drain and Culvert Pipe
T. ASTM C443 - Joints or Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
U. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings
V. ASTM D1785 - Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120
W. ASTM D2683 - Socket type Polyethylene fillings for outside diameter controlled polyethylene pipe
X. AWS A5.8 - Brazing Filler Metal
Y. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
Z. AWWA C110 - Ductile Iron Gray Iron Fittings three inch (3") through 48 inch for Water and Other Liquids
AA. AWWA C111 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
AB. AWWA C651 - Disinfecting Water Mains
AC. AWWA C900 - Poly Vinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, Four Inch (4") Through Sixty Inch (60")
AD. AWWA C907 - Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, Four Inch (4") Through Twelve Inch (12"), For Water, Wastewater, and Reclaimed Water Service
AE. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems
AF. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems
AG. NSF/ANSI 61 - Drinking Water System Components - Health Effects
AH. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data
      b. Schedule of all system types and piping and fitting types provided, clearly indicating which submitted piping and fittings are associated to each system on the project. Schedule shall be at the beginning of piping submittal.
      c. Installation Instructions
C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Operation and Maintenance Information, including spare parts list and exploded assembly views.
D. Project Record Documents
   1. Indicate final installed locations of all valves on a PDF floor plan

1.05 QUALITY ASSURANCE

A. Perform work in accordance with the State of Iowa.
B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

D. Welder's Certification: In accordance with ASME Section IX.

E. Identify pipe with marking including size, material classification, specification, potable water certification and water pressure rating.

F. Maintain one copy of each document on site.

G. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.

H. All cast iron soil pipe and fittings shall be installed according to the latest edition of the Cast Iron Soil Pipe and Fittings Handbook.

1.06 REGULATORY REQUIREMENTS

A. Perform work in accordance with local jurisdiction plumbing code.

B. Conform to applicable code for installation of back flow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of back flow prevention devices.

D. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, protect and handle products to site.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.08 WARRANTY

A. Provide a 25-year non-prorated warranty on PEX tubing.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING (BELOW GRADE)

A. Cast Iron Pipe:
   1. ASTM A74 service weight.
   2. Fittings: Cast iron.
   3. Joints: ASTM C564, neoprene gasket system.
   4. Minimum Size: Three inches.
   5. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.

B. PVC Pipe: Schedule 40
   1. ASTM D2665.
   2. Fittings: PVC.
   3. Joints: ASTM D2855 solvent weld with ASTM D2564 solvent cement.

C. PVC Pipe:
   1. ASTM D2665.
   2. Fittings: PVC.
   3. Joints: ASTM F477, elastomeric gaskets.

2.02 SANITARY SEWER PIPING (ABOVE GRADE)

A. Cast Iron Pipe:
   1. CISPI 301 hubless service weight three inch (3") and larger.
   2. Fittings: Cast iron.
   3. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies conforming to CISPI 310.
   4. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.

B. Copper Tube:
   1. ASTM B306, type #M.
   2. Fittings: ASME B16.29 wrought copper.
   3. Joints: ASTM B32 solder Grade 50B.

C. Copper Pipe:
   1. ASTM B42.
   2. Fittings: ASME B16.29 wrought copper.
   3. Joints: ASTM B32 solder Grade 50B.

D. PVC Pipe:
   1. ASTM D2665.
   2. Fittings: PVC.
   3. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.03 FIRE PROTECTION WATER SERVICE (BELOW GRADE)

A. Ductile Iron Pipe (Class 52):
   1. AWWA C151, piping equal to or greater than 3 inches.
   2. Fittings: Ductile iron, standard thickness.
   3. Joints: AWWA C111, rubber gasket with 3/4" diameter rods.

2.04 WATER PIPING (BELOW GRADE)

A. Copper Tubing:
   1. ASTM B88, type #K hard drawn, piping less than three inches.
   2. Fittings: ASME B16.18, cast bronze.
   3. Joints: AWS A5.8, BCuP silver braze.

B. Ductile Iron Pipe:
   1. AWWA C151, piping equal to or greater than three inches.
   2. Cement lined ductile iron pipe.
   3. Fittings: Ductile iron, standard thickness.
   4. Joints: AWWA C111, rubber gasket with 3/4 inch diameter rods.

C. Copper Tubing:
   1. ASTM B88, type #K soft coil, tubing less than three inches.
   2. Fittings: ASME B16.18, cast bronze, only for above grade connections.
   3. Joints: AWS A5.8 BCuP silver braze, only for above grade connections.

2.05 WATER PIPING (ABOVE GRADE)

A. Copper Tubing:
   1. ASTM B88, type #L hard drawn.
   2. Fittings: ASME B16.22, wrought copper and bronze.
   3. Joints: ASTM B32, solder, Grade 95TA.

2.06 WATER PIPING (PRESS FITTINGS)

A. Manufacturers:
   1. Viega (Propress)
   2. Nibco
   3. Engineer approved equal.

B. Material:
   1. Tubing Standard:
      a. Copper tubing shall conform to ASTM B75 or ASTM B88.
   2. Press Fitting:
      a. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117 or ASME B16.51. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed and of the same manufacturer.

2.07 STORM WATER PIPING (BELOW GRADE)

A. PVC Pipe: (Up to 10 Inch)
   1. ASTM D2665. Schedule 40
   2. Fittings: Schedule 40 PVC
   3. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.08 STORM WATER PIPING (ABOVE GRADE)

A. PVC Pipe:
   1. ASTM D1785 Schedule 40
   2. Fittings: PVC.
   3. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.09 BALL VALVES (UP TO AND INCLUDING 2 INCHES)

A. Manufacturers:
   1. Apollo #77CLF-140/240
   2. Watts #LFB 6080/6081 G2-SS
   3. Nibco #S/T-585-66-LF
   4. Milwaukee #UPBA-400S/450S
   5. Engineer approved equal.

B. Bronze two piece full port body, stainless steel ball and stem, RPTFE seats and thrust washer, lever handle, solder or threaded ends.

2.10 BUTTERFLY VALVES (OVER 2 INCHES)

A. Manufacturers:
   1. DeZurik
   2. Apollo
   3. Milwaukee
   4. Engineer approved equal.

B. Body: Cast iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

C. Disc: Stainless steel 316.

D. Stem: Stainless steel 316.

E. Operator: Ten position lever handle. All butterfly valves six inch and larger shall have gear operated handles.

2.11 SPRING LOADED CHECK VALVES

A. Manufacturer:
   1. NIBCO
   2. Watts
   3. Apollo
   4. Engineer approved equal.

B. Check Valves:
   1. Up to 2 Inches: Spring loaded, silent water check valve, bronze body and trim. Stainless steel spring, threaded ends, 300 psi W.O.G. Renewable parts.
   2. Over 2 Inches: Spring loaded globe type, silent check valve, iron body, bronze trim. Stainless steel spring, 250 psi ASA flanged, 250 psi W.O.G. renewable parts.

2.12 RELIEF VALVES

A. Manufacturers:
   1. Bell & Gossett
   2. Taco
   3. Conbraco
   4. Engineer approved equal.

B. Pressure Relief: Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.13 STRAINERS

A. Manufacturers:
   1. Metraflex
   2. Watts
   3. Engineer approved equal.

B. Size 2 Inches and Under: Screwed brass body for 175 psig working pressure, "Y" pattern with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2" to 4 Inches: Flanged iron body for 175 psig working pressure, "Y" pattern with 3/64 inch stainless steel perforated screen.

D. Size 5" and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.14 FIRE STOP SYSTEMS

A. Manufacturers:
   1. 3M
   2. Engineer approved equal.

B. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

C. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three hours per ASTM E814 and UL 1479.

D. DWV Plastic Pipe Systems Fire Stopping Sealant: Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three hours per ASTM E814 and UL 1479 with metal collars.

2.15 DRAIN BALL VALVES

A. Manufacturers:
   1. Apollo #95-ALF
   2. Engineer approved equal.

B. Bronze two-piece full port body chrome plated ball and stem.

C. Teflon seats and stuffing, box ring, lever handle, drain cap and seal, [solder] [threaded] ends.

2.16 PIPE ACCESSORIES

A. Fittings:
   1. All fittings shall be of the same material as the pipe. Material joining the fitting to the pipe shall be free from cracks and shall adhere tightly to each joining surface.
   2. All fittings shall be capped with a plug of the same material as the pipe, and gasketed with the same gasket material as the pipe joint or be of material approved by the engineer. The plug shall be able to withstand all test pressures involved without leakage.

2.17 POST INDICATOR VALVE

A. Manufacturers
   1. Clow
   2. Kennedy

3. Mueller
4. Engineer approved equal.

B. Valve: Cast iron body, 100% EPDM coated AWWA C-509 NRS gate valve, non-rising bronze stem, UL/FM approved.

C. Post Indicator: Cast iron top section, AISI M1020 1" square stem, ductile iron standpipe, cast iron base flange for gate valve, UL/FM approved, Lexan site window.

D. Wiring and conduit by fire alarm and electrical contractors. Provide with tamper switch and breakaway padlock.

2.18 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, type #M, hard drawn.
1. Fittings: ASME B16.18 cast brass.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony or tin and silver with melting range 430 deg F to 535 deg F.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install 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 conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Establish elevations of buried sanitary and storm sewer piping outside the building to ensure not less than four feet (4') of cover unless otherwise noted.

J. Establish elevations of buried water service outside the building to ensure not less than six feet (6') of cover unless otherwise noted.

K. Where pipe support members are welded to structural building frame, scrape, brush clean and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports and accessories not pre-finished, ready for finish painting.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Install water piping to ASME B31.9.

Q. Sleeve pipes passing through partitions, walls and floors.

R. Clean out all sanitary sewers to remove any debris prior to substantial completion.

S. All cast iron soil pipe shall be installed in accordance with cast iron soil pipe institute handbook (latest edition).

T. All cast iron soil pipe shall be marked with the trademark of the soil pipe institute.

U. Provide post indicator valve with breakaway padlock.

V. Where static water pressure in the water supply piping exceeds 80 psi, a water pressure reducing valve preceded by a strainer shall be installed and the static pressure reduced to 80 psi or less. Pressure regulator(s) equal to or exceeding 1-1/2 inches shall not require a strainer.

3.03 PRESS FITTING INSTALLATION

A. The installing contractor shall examine the copper tubing and fittings for defects, sand holes or cracks. There shall be no defects of the tubing or fittings. Any damaged tubing or fittings shall be rejected.

B. The installing contractor shall ensure that sealing elements are properly in place and free from damage. For sizes 2-1/2” to 4”, installer should ensure that the stainless steel grip ring is in place.

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, slag, dirt, and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool.

E. 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 fittings. 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 tools approved by the manufacturer.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot 1% minimum. Maintain gradients.

B. Slope water piping minimum 0.25% and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. The plumbing contractor is responsible for providing disinfection of domestic water piping system as outlined in this section.

B. Prior to starting work, verify system is complete, flush and clean.

C. The plumbing contractor is to make sure sanitary sewer lines are running smooth by running a snake through the sanitary sewer lines prior turning the facility over to the owner.

D. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

E. Inject disinfectant, free chlorine in liquid, powder or tablet form throughout system to obtain 50-to 80 mg/L residual.

F. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15% of outlets.

G. Maintain disinfectant in system for 24 hours.

H. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

I. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

J. Take samples no sooner than 24 hours after flushing from 10% of outlets and from water entry and analyze in accordance with AWWA C651. Submit written report to owner.

K. Work in this section shall be by a pre-approved water treatment contractor.

3.07 TESTING

A. This contractor shall, before concealing, test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall be held responsible for all damage resulting from defects in the system.

C. Domestic Water Testing:
   1. At conclusion of construction (before any covering up, painting, or finishing) each portion of the piping or of the entire hot and cold water supply system, it shall be initially tested to be proved tight under 50 psi air pressure. All piping shall withstand test pressures without leaking for a period of time not less than 15 minutes.
   2. The system shall not be filled with water until immediately prior to disinfection. A hydrostatic test to a water pressure of 1.5x working pressure up to a maximum of 150 psi shall be performed. All piping shall withstand test pressures without leaking for a period of time not less than 4 hours.

D. Sanitary and Storm Testing:
   1. A hydrostatic test to a water pressure of 10 feet shall be performed. All piping shall withstand test pressures without leaking for a period of time not less than 4 hours.

E. No covering or backfilling of sewer lines shall be done until inspected by the architect or local inspector. Test T's shall be provided on all waste and vent stacks 4'-6" above each floor as required for testing the plumbing system.

F. After completion of installation, the systems shall be given tests under full operating conditions and pressures and all adjustments shall be made to make the system operative as required. All safety devices shall be tested for correct operation.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
   2. Install service piping and valves as indicated on the site drawing. Provide thrust blocks at all changes in direction. Verify the local city requirements prior to bid.
   3. Install remote meter readout and associated wiring. Coordinate location with utility company.

C. The plumbing contractor is responsible to contact and inform the utility companies, prior to the utility companies coming to the site, of any underground utilities and piping they may be aware of.

D. Charges by the utility company to provide services shall not be included in the bid and shall be paid directly by the owner.

3.09 UTILITY CONNECTIONS

A. Connect to existing utility services as shown on the drawings or as required by site conditions.

B. Before running any new sewer piping, verify elevations where connections are to be made and layout the new sewer. If grades do not allow connection, verify with architect or engineer what procedures to use.

C. Use caution on sewer extensions so that grades do not become to shallow.

D. Coordinate equipment and installation requirements with local utility company.

E. Verify requirements prior to bid.

F. Charges by the utility company to provide services shall not be included in the bid and shall be paid directly by the owner.

G. The plumbing contractor is responsible to contact and inform the utility companies, prior to the utility companies coming to the site, of any underground utilities and piping they may be aware of.

3.10 SCHEDULES

A. See the drawings.

END OF SECTION 22 11 16

SECTION 22 11 19
DOMESTIC PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drain
B. Floor sink
C. Trench drain
D. Clean out
E. Hose bib
F. Wall hydrant
G. Recessed valve box
H. Backflow preventer
I. Water hammer arrestor
J. Trap Primers
K. Master Mixing Valve

1.02 RELATED SECTIONS

A. Specification Section 22 11 16 - Domestic Plumbing Piping
B. Specification Section 22 30 00 - Plumbing Equipment
C. Specification Section 22 40 00 - Plumbing Fixtures

1.03 REFERENCES

A. ASME A113.6.3; Floor and Trench Drains
B. ASME A113.6.4 - Roof, Deck and Balcony Drains
C. ASSE 1010-01; Water Hammer Arrestors
D. ASSE 1011 - Hose Connection Vacuum Breakers
E. ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent
F. ASSE 1013 - Backflow Preventers, Reduced Pressure Principle
G. ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types
H. ASTM C478 - Precast Reinforced Concrete Manhole Sections (ASTM C478M - Precast Reinforced Concrete Manhole Sections
I. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types
J. PDI G-101 - Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
K. PDI WH-201 - Water Hammer Arrestors
L. NSF/ANSI 61 - Drinking Water System Components - Health Effects
M. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal

1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
    a. Product Data: Provide component sizes, rough-in requirements, service sizes and finishes.
    b. Shop Drawings: Indicate dimensions, weights and placement of openings and holes.
    c. Certificates: Certify that grease interceptors meet or exceed specified requirements.
    d. Installation Instructions

C. Closeout submittal
1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
    a. Operation and Maintenance Information, including required frequency of treatment for interceptors, spare parts lists, and exploded assembly views.

D. Project Record Documents
1. Record actual locations of tagged valves, including valve tag numbers.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.07 REGULATORY REQUIREMENTS

A. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

PART 2 PRODUCTS

2.01 FLOOR DRAIN

A. Manufacturers:
1. Watts #FD-100
2. Smith
3. Zurn
4. Josam
5. Wade
6. Engineer approved equal.

B. Assembly: ASME A112.6.3.

C. Epoxy coated cast iron floor drain with anchor flange, reversible clamping collar with primary and secondary weepholes and adjustable strainer.

D. Accessories:
1. Provide with membrane clamp on all floor drains installed above slab ongrade.
2. Provide with strainer extension to accommodate thick fills as required.

E. Strainer: Seven inch (7") diameter nickel bronze strainer.

F. Contractor shall select outlet type.

G. Outlet size: As noted on drawings.

H. Options: Provide where indicated:
1. 6 x 6 square nickel bronze strainer.
2. Heavy Duty (HD) strainer.
3. 4"] [6"] [4" x 9" oval] nickel bronze funnel.
4. Sediment bucket.
5. Trap primer.

2.02 FLOOR SINK (FS-1)

A. Manufacturers:

1. Watts #FS-740
2. Smith
3. Zurn
4. Josam
5. Wade
6. Engineer approved equal.

B. Assembly: ASME A112.6.3

C. Square 12" x 8" deep sanitary floor sink with white porcelain enamel coated interior, loose set porcelain enamel coated cast iron grate and aluminum dome bottom strainer.

D. Accessories:
1. Sediment bucket.
2. Flange with weep holes.
3. Flashing clamp on all floor drains installed above slab on grade.

E. Contractor shall select outlet type.

F. Outlet Size: As noted on drawings.

G. Options: Provide where indicated.
1. 3/4 grate

2.03 TRENCH DRAIN

A. Manufacturers:
1. Zurn Perma-Trench
2. Ancon
3. Josam
4. Wade
5. Dura Trench
6. Engineer approved equal.

B. Perma-Trench Z-886, six inches (6") wide with interlocking ends and ductile iron slotted grate with Load E rated.

C. [Provide a 24" x 24" catch basin Zurn Z-887-24 with removable basket strainer, ductile iron slotted grate and end outlets, and structural composite reinforced body.

2.04 CLEAN OUT

A. Manufacturers:
1. Watts
2. Smith
3. Josam
4. Wade
5. Sun Drainage
6. Engineer approved equal.

B. Interior Finished Sub or On Grade Floors:
1. Watts #C0-200-R
2. Lacquered cast iron bodies with integral anchor flange, neoprene "O" ring secondary test seal and adjustable combined access cover and plug with gasket seal. Nickel-bronze scoriated cover in service area and round with depressed cover to accept floor finish in finished floor areas.

C. Interior Finished Wall Areas:
1. Watts #CO-380-RD
2. Line type with lacquered cast iron body and round epoxy coated gasket cover and round stainless steel access cover secured with machine screw.

D. Exterior Cleanouts:
1. Provide with bronze plug and round heavy duty cast iron or nickel bronze cleanout cover equal to JOSAM 58680-CO.

2. Refer to detail on drawings.

E. Cleanout size shall be equal to pipe size up to 4 inches.

2.05 HOSE BIB (HB-1)

A. Manufacturers:
1. Woodford #B24
2. Prier #C155CP.75
3. Engineer approved equal.

B. Interior: Brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated lockable box and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.06 WALL HYDRANT (WH-1)

A. Manufacturers:
1. Woodford #B67
2. Prier #C-634BX
3. Engineer approved equal.

B. Type: ASSE 1019 non-freeze, self draining type with chrome plated lockable recessed box hose thread spout, lockshield and removable key with integral double check backflow preventer.

C. 3/4" inlet and outlet.

D. Architect to select finish.

2.07 RECESSED VALVE BOX

A. Manufacturers:
1. Guy Gray #82032 Galvanized
2. Engineer approved equal.

B. Washing Machine: Pre-formed rough-in box with 1/2" brass long shank water valves with wheel handles, socket for two inch (2") threaded center drain and slip in finishing cover.

C. Provide a stainless steel sleeve extension with wall flange, where recessed valve box is installed in a block wall.

2.08 RECESSED VALVE BOX (DRAIN ONLY)

A. Manufacturers:
1. Guy Gray #82174 Stainless Steel
2. Engineer approved equal.

B. Pre-formed rough-in box with socket for two inch (2") center drain and slip in finishing cover.

C. Provide a stainless steel sleeve extension with wall flange, where recessed valve box is installed in a block wall.

2.09 RECESSED VALVE BOX (VB-1)

A. A. Manufacturers:
1. Guy Gray #87939 Metal
2. Engineer approved equal.

B. White outlet box with 1/2" sweat connection with 3/8" outlet quarter turn valve with integral hammer arrester, and slip in finishing cover.

2.10 BACKFLOW PREVENTERS (RPZ, 2" AND SMALLER)

A. Manufacturers:
1. Watts LF919
2. Zurn/Wilkins
3. Conbraco/Apollo
4. Febco
5. Ames
6. Engineer approved equal.

B. Description: Reduced Pressure Zone Assembly consisting of two independent check valves with a pressure monitored chamber in between. The chamber contains a differential pressure relief valve that relieves excess pressure preventing back flow or back siphonage.

C. Construction:
   1. Springs: Stainless Steel
   2. Discs: Silicone
   3. Access ports: Device shall have 3 access ports. One for each check valve and one for the relief valve assembly. A single access port is not acceptable.

D. Accessories:
   1. Strainer: Y-type lead free strainer
   2. Air Gap Fitting: Provided by BFP manufacturer
   3. Shut off Valves: Quarter turn ball valves

E. Approvals:
   1. ASSE 1013
   2. Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.
   3. NSF/ANSI 61 (Less than 0.25% Lead by weight)
   4. UL Classified (not valves)

2.11 BACKFLOW PREVENTERS (RPZ, 2-1/2" AND LARGER)

A. Manufacturers:
   1. Watts LF957
   2. Zurn/Wilkins
   3. Conbraco/Apollo
   4. Febco
   5. Ames
   6. Engineer approved equal.

B. Description: Reduced Pressure Zone Assembly consisting of two independent check valves with a pressure monitored chamber in between. The chamber contains a differential pressure relief valve that relieves excess pressure preventing back flow or back siphonage.

C. Construction:
   1. Housing and Sleeve: 304 Stainless Steel
   2. Springs: Stainless Steel
   3. Discs: Silicone

D. Accessories:
   1. Strainer: Stainless Steel Y-type lead free strainer
   2. Air Gap Fitting: Provided by BFP manufacturer
   3. Shut off Valves: Butterfly Valves

E. Approvals
   1. ASSE 1013
   2. Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California
   3. NSF/ANSI 61 (Less than 0.25% Lead by weight)
   4. UL Classified (less valves)

2.12 BEVERAGE DISPENSING BACKFLOW PREVENTERS (CARBONATED BEVERAGE, COFFEE MAKERS, ETC)

A. Manufacturers:
   1. Watts SD-3
   2. Zurn
   3. Apollo
   4. Engineer approved equal.

B. Description: 3/8” dual check device with atmospheric vent port designed to protect the domestic water supply from direct connect beverage machines. Manufacturer provided wye strainer. Vent port opens to atmosphere in the event of second check valve failure.

C. Construction:
   1. Body: 316 Stainless Steel
   2. Internal Components: FDA approved rubber
   3. Strainer: NSF approved acetal plastic

D. Accessories
   1. Shut-off: Stainless steel ball valve

E. Approvals:
   1. ASSE 1032
   2. NSF/ANSI Standards 18 and 61

F. Installation
   1. Able to be installed horizontally or vertically.
   2. Install so that strainer and valve are accessible for service and maintenance. Device shall not be installed within a wall cavity.
   3. Connect a vent discharge line to the vent outlet and route to nearby floor drain or floor sink.

2.13 WATER HAMMER ARRESTOR

A. Manufacturers:
   1. Zurn "Shoktro" #Z-1700
   2. Sioux Chief
   3. Engineer approved equal.

B. ANSI A112.26.1; sized in accordance with PDI WH-201 pre-charged suitable for operation in temperature range of -100 deg to 250 deg F and maximum 350 psig working pressure.

2.14 AUTOMATIC TRAP PRIMER

A. Manufacturers
   1. Sioux Chief 695
   2. Engineer approved equal.

B. Automatic trap primer that shall activate with a 10 PSIG pressure drop in the connected cold water pipe. 1/2" inlet and outlet. Water release amount shall be factory set. ASSE 1018 certified. 30-250 PSIG working pressure.

2.15 MASTER MIXING VALVE

A. Manufacturers:
   1. Lawler
   2. Leonard
   3. Symmons
   4. Powers
   5. Engineer Approved Equal

B. Valve: Bronze body with corrosion resistant components, stainless steel or copper alloy bellows, mounted out of water, integral temperature adjustment. Removable cartridge with strainer, stainless steel piston and liquid fill thermal motor.

C. Capacity: See detail and schedule on drawings.

D. Accessories:
   1. Check valve on inlets.
   2. Volume control shut-off valve on outlet.
   3. Stem thermometer on outlet.
   4. Strainer stop checks on inlets.

E. Valves shall be provided in a pre-piped manifold including mounting strut, circuit setting balancing valve, thermometers, ball valves, and a recirculating pump. See schedule on drawings for circulating pump requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains to require invert elevations.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend clean out to finished floor or wall surface. Lubricate threaded clean out plugs with mixture of graphite and linseed oil. Ensure clearance at clean out for rodding of drainage system. Coordinate all cleanout locations with the architect.

C. Furnish and install cleanouts at locations as specified and required by local plumbing code.

D. Encase exterior clean out in concrete flush with grade.

E. Install floor clean out at elevation to accommodate finished floor.

F. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior hose bibbs and exterior wall hydrants.

G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures. Fabricate same size as supply pipe or 3/4 inch minimum and minimum 18 inch long.

H. Install air gap fittings at all equipment drains when equipment is connected to domestic water.

I. Provide floor drains installed above slab on-grade with membrane clamp and 3' x 3' vinyl membrane. Membrane is by the mechanical contractor.

J. Coordinate all floor drain locations with associated equipment.

K. Coordinate all wall mounted device locations with architect.

L. Install flood protection shutdown valve upstream of building backflow preventer.

M. Install back water valves where required by local codes. Coordinate with architect.

N. Route interceptor vent pipes back through building to roof. Coordinate routing with engineer and architect prior to rough-in.

END OF SECTION 22 11 19

SECTION 22 15 00
COMPRESSED AIR SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings
B. Valves
C. Unions and couplings
D. Air compressor
E. After cooler
F. Air dryer
G. Air receiver
H. Pressure reducing valve
I. Hose reels

1.02 RELATED SECTIONS

A. Specification Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment
B. Specification Section 22 05 53 - Identification for Plumbing Piping and Equipment

1.03 REFERENCES

A. ASME - Boiler and Pressure Vessel Code
B. ASME B16.3 - Malleable Iron Threaded Fittings
C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
D. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings
E. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes
F. ASME B31.1 - Power Piping
G. ASME B31.9 - Building Services Piping
H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
I. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
J. ASTM B32 - Solder Metal
K. ASTM B88 - Seamless Copper Water Tube ASTM B88M - Seamless Copper Water Tube
L. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
M. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe
N. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves
O. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
P. NFPA 70 - National Electrical Code

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents.
    4. Have options clearly indicated as applicable to each submittal.
B. Construction submittal

1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
    a. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.
    b. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.
    c. Certificates: Provide certificate of compliance from authority having jurisdiction indicating approval of air receiver.
    d. Installation Instructions

C. Closeout submittal
1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
2. Operation and Maintenance Information
3. Warranty: Submit manufacturer warranty and ensure forms have been completed in owner's name and registered with manufacturer.
4. Test Reports: Submit inspector's certificate for air receiver for inclusion in Operating and Maintenance Manuals.

D. Project Record Documents
1. Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable codes for installation of pressure vessels.

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 PROTECTION

A. Accept air compressors, refrigerated air dryer on site in factory fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.

B. Protect piping and equipment from weather and construction traffic.

1.08 WARRANTY

A. Provide a five-year manufacturer warranty for reciprocating air compressors.

1.09 MAINTENANCE PRODUCTS

A. Furnish two quart containers of compressor oil.

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Aluminum Pipe: 6063-T5 per ASTM B241.
1. Manufacturers:
    a. Transair
    b. AirCom
    c. AIRpipe
    d. Engineer approved equal.
2. Fittings:
    a. For pipe sizes up to and including 1-1/2”: Gripping ring technology with half-turn release. Polymer PA6.6 or PA 12 with 30% fiberglass reinforcement with stainless steel gripping teeth and nitrile seals.
3. Drop Connectors:

a. Single body with compact swan neck water retention system with a 46 mm center to center outlet. Polymer PA6.6 or PA12 with 30% fiberglass reinforcement.

4. Fixing Clips:
   a. For use with pipe sizes up to and including 2-1/2". Polymer PA6.6 or PA12 with 30% fiberglass reinforcement.
   b. Clips shall allow an axial movement of pipe to account for expansion and contraction.
5. The pipe shall be qualified per ISO 9001, in order to warranty gripping and bubble-tight performance.
6. The pipe shall be powder coated or provided with a corrosion resistant coating to protect the piping for warranty.
7. Components shall be non-flammable with no propagation of flame.
8. Working pressure shall be constant across the temperature range of -4°F to 140°F. Max working pressure shall be 232 psi at 115°F.
9. Valves & piping accessories shall be from the same manufacturer as the piping system.

2.02 VALVES

A. Gate Valves:
   1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, hand wheel, inside screw, solid wedge disc, [solder] [threaded] ends.

B. Ball Valves:
   1. MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, [solder] [threaded] ends with union.

C. Swing Check Valves:
   1. Manufacturers:
      a.
      b. Engineer approved equal.
   2. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, [solder] [threaded] ends.

2.03 UNIONS AND COUPLINGS

A. Unions:
   1. Ferrous Pipe: 150 psi malleable iron threaded unions.
   2. Copper Tube and Pipe: 150 psi bronze unions with soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

C. Flexible Connector: Neoprene with brass threaded connectors.

2.04 AIR COMPRESSOR

2.05 AFTER COOLER

A. Construction: Removable tube nests of non-ferrous metal tubes and corrosion resistant tube plates, safety valves, pressure gauge, moisture separator, moisture drain valve, water inlet piping with automatic water valve, automatic condensate trap and overflow piping with open funnel.

B. Working Pressure: 135 psi.

C. Discharge: Cool air to within 12 deg F of ambient air temperature at specified flow capacity.

2.06 AIR DRYER

A. Manufacturer:
   1. FS Curtis ML Series
   2. Champion
   3. Engineer approved equal.

B. Type: Self contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.

C. Air Connections: Inlet and outlet connections at the same level, factory insulated.

D. Heat Exchangers: Air to air and refrigerant to air coils.

E. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.

F. Moisture Separator: Centrifugal type located at discharge of heat exchanger.

G. Refrigeration Unit: Hermetically sealed type to operate continuously to maintain the specified 21 deg F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.

H. Accessories: Air inlet temperature gauge, air inlet pressure gauge, on/off switch, high temperature light, power on light, refrigerant gauge, air outlet temperature gauge, air outlet pressure gauge.

I. See schedule on drawings for additional information.

2.07 AIR RECEIVER

A. Receiver: Vertical, built to ASME regulations for working pressure of 125 psi. Flange or screw inlet and outlet connections.

B. Fittings: Adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic float actuated condensate trap.

C. Tank Finish: Shop primed

2.08 PRESSURE REDUCING VALVE

A. Pressure Reducing Station: Consisting of automatic reducing valve and bypass, and low pressure side relief valve and gauge. Provide oil separator where indicated.

B. Valve Capacity: Reduce pressure from 200 psi to 30 psi, adjustable upwards from reduced pressure.

2.09 MEDIUM DUTY HOSE REELS

A. Manufacturer:
   1. Reelcraft RT Series (Basis of Design)
   2. Engineer approved equal.

B. 3/8" ID x 50 foot wire braided hose rated for 300 PSIG, spring driven hose reel with engineered plastic spool. Provide with mounting bracket for wall or ceiling mounting. Refer to drawings for mounting locations/requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install compressor unit on concrete housekeeping pad.

B. Install compressor unit on vibration isolators. Level and bolt in place. Refer to Specification Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment

C. Make air cock and drain connection on horizontal casing.

D. Install line size gate valve and check valve on compressor discharge.

E. Install replaceable cartridge type filter silencer of adequate capacity for each compressor.

F. Place shut off valve on water inlet to after-cooler. Pipe drain to floor drain.

G. Connect condensate drains to nearest floor drain.

H. Install valve bypass around air dryer. Factory insulate inlet and outlet connections.

I. Install valve drip connections at low points of piping system.

J. Install take off to outlets from top of main with shut off valve after take off. Slope take off piping to outlets.

K. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.

L. Install tees instead of elbows at changes in direction of piping. Fit open end of each tee with plug.

M. Identify piping system and components. Refer to Specification Section 22 05 53 - Identification for Plumbing Piping and Equipment.

3.02 FIELD QUALITY CONTROL

A. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ANSI B31.1.

B. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

C. Cap and seal ends of piping when not connected to mechanical equipment.

END OF SECTION 22 15 00

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Residential sealed combustion water heater
B. Diaphragm type expansion tank
C. Water softener
D. In-line circulator pump

1.02 REFERENCES

A. ASHRAE 90A - Energy Conservation in New Building Design
B. ASME Section 8D - Pressure Vessels
C. NFPA 30 - Flammable and Combustible Liquids Code
D. NFPA 54 - National Fuel Gas Code
E. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases
F. NFPA 70 - National Electrical Code
G. UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters
H. UL 174 - Household Electric Storage Tank Water Heaters
I. ASME Section VIIID - Pressure Vessels; Boiler and Pressure Vessel Codes
J. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 volts max.)
K. NSF/ANSI 61 - Drinking Water System Components - Health Effects
L. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.03 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data:
    2. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
    3. Indicate pump type, capacity, power requirements, and affected adjacent construction.
    4. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
    5. Provide electrical characteristics and connection requirements.
        a. Shop Drawings:
    6. Indicate heat exchanger dimensions, size of tappings, and performance data.
    7. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
C. Closeout submittal
    1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Operation and Maintenance Information, including inspection data, replacement part numbers, availability, service depot location, and telephone number.

b. Warranty: Submit manufacturer warranty and ensure forms have been completed in owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. American Gas Association (AGA)
   2. National Sanitation Foundation (NSF)
   3. American Society of Mechanical Engineers (ASME)
   4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI)
   5. National Electrical Manufacturers' Association (NEMA)
   6. Underwriters Laboratories (UL)

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25% of midpoint of published maximum efficiency curve.

1.05 REGULATORY REQUIREMENTS

A. Conform to NSF, NBBPVI, and ANSI/NFPA requirements for water heaters.

B. Conform to ASME Section VIIID for manufacture of pressure vessels for heat exchangers.

C. Conform to ASME Section VIIID for tanks.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

E. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store, protect and handle products to site under provisions of Architectural Specification Sections.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. Provide five-year manufacturer warranty under provisions of Architectural Specification Sections.

B. Provide a two-year manufacturer warranty for the variable speed packaged pumping system.

C. Provide five-year manufacturer warranty for water-to-water heat exchanger.

1.08 MAINTENANCE PRODUCTS

A. Supply two 50 lb. bags of water softener salt.

B. Provide each water softener system full of salt at substantial completion.

1.09 EXTRA MATERIALS

A. Provide two pump seals.

PART 2 PRODUCTS

2.01 RESIDENTIAL SEALED COMBUSTION WATER HEATER

A. Manufacturers:
   1. A.O. Smith
   2. Lochinvar
   3. Bock
   4. Ruud

5. PVI
6. Laars
7. Engineer approved equal.

B. Provide PVC sealed combustion and power vent pipe complete with intake and flue terminations.

C. Type: Automatic, natural gas-fired, vertical storage with sealed combustion and direct power vent.

D. Performance: See schedule.

E. Tank: Glass lined welded steel, four inch (4") diameter inspection port, thermally insulated with minimum two inch (2") fiberglass and encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

F. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME temperature and pressure relief valve. Pipe relief valve to above floor drain.

G. Approval: By AGA as automatic storage water heater and automatic circulating tank water heater for operation at 140 deg F.

H. Controls: Automatic water thermostat with temperature range adjustable from 120-180 deg F gas pressure regulator, multi-ribbon or tubular burner, 100% safety shut off and thermocoupler, flue baffle, draft hood, and intermittent pilot operation with automatic flue power vent fan.

I. Provide PVC flue to stack or through roof, per manufacturer's installation recommendations. Provide roof flashing, counter flashing and rain cap.

J. Provide one diaphragm expansion tank rated for a maximum allowable working pressure equal to or greater than the pressure of the water heater. Refer to drawings for expansion tank sizing.

2.02 ELECTRIC WATER HEATER (RESIDENTIAL, SMALL POINT-OF-USE)

A. Manufacturer:
1. Rheem #EGSP-15
2. A.O. Smith
3. State
4. Engineer approved equal.

B. Type: Automatic, electric, and vertical storage. Commercial quality.

C. Performance: See schedule.

D. Electrical Characteristics: [____] volt, [single] [three] phase.

E. Tank: Glass lined welded steel, thermally insulated with one inch (1") thick fiberglass (encased in corrosion-resistant steel jacket) baked-on enamel finish.

F. Controls: Automatic water thermostat with [externally adjustable] temperature range from 120 to 170 deg F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box. Wire double element units so elements do not operate simultaneously, unless noted otherwise.

G. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME temperature and pressure relief valve.

2.03 DIAPHRAGM-TYPE EXPANSION TANK

A. Manufacturer:
1. Amtrol
2. Taco
3. American Wheatley
4. Engineer approved equal.

B. Construction: Welded steel, tested and stamped in accordance with Section VIIID of ASME Code; supplied with National Board Form U-1, rated for a maximum allowable working pressure equal to or greater than the pressure of the water heater with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; pre-charge to 55 psig. Verify pressure with system water pressure.

D. Size: When water heater size is over 120 gallons or 200 MBH provide ASME rated tank. Refer to water heater size for requirements.

2.04 WATER SOFTENER (SINGLE TANK)

A. Manufacturers:
   1. Culligan
   2. Marlo
   3. Ecowater Systems
   4. Kinetico
   5. Engineer approved equal.

B. Provide as indicated, a vertical pressure type water softener system complete with pressure vessel, softening resin, control valve, brine maker and electronic controller. The system will be of any approved design as fabricated by a manufacturer regularly engaged in the production of water treatment equipment. All equipment and material will be supplied in compliance with the specifications as intended for a complete and operational system.

C. Single/Aqua-Sensor/Demand:
   1. The purpose of the water softener will be to remove mineral hardness from a known water supply to a level not to exceed 17.1 mg/l, as determined by an accepted ASTM or EDTA test method.
   2. There shall be a quantity of one (1) of the above described systems.

D. Performance and Design Data:
   1. See schedule on the drawings.

E. Softener Tank(s):
   1. Each system shall include one (1) tank(s). The sideshell height shall be sufficient to allow for a proper freeboard space above the resin bed for adequate expansion of the resin during backwashing.

F. Main Operating Valve:
   1. The main operating valve shall be of a top mount design constructed of all brass and sized with 2.0 inch NPTI inlet and outlet connections.
   2. The main operating valve will be of the motor driven, mechanically activated design with five (5) positions to accomplish the regeneration steps of backwash, brine draw/rinse, fast rinse and brine refill, in addition to the service position.
   3. The main operating valve shall incorporate self adjusting flow regulators to control the rate of flow and prevent resin loss during backwash regardless of system pressure fluctuations between 30.0 and 120.0 psi.
   4. The main operating valve will be fitted with a fixed orifice eductor.
   5. The unit shall be supplied so that the valve will not allow automatic bypass of untreated water during regeneration. The bypass shall be integral to the main operating valve body and be capable of being easily modified to allow untreated water bypass.

G. Controls:
   1. A fully integrated programmable microprocessor driven electronic controller shall be provided to automatically cycle the main operating valve through the regeneration sequence. The electronic controller shall be designed and manufactured by the same manufacturer as the water treatment equipment.
   2. The controller shall be capable of initiating a regeneration by accepting an internal signal from the controller time keeping device; an external Hall-Effect flow sensor, a Culligan Aqua-Sensor, an external device such as a remote start push-button or any combination of these methods. The controller shall sequence all steps of an automatic regeneration and automatically return the softener to a service or stand-by mode. The initiating time and/or volume setpoints shall automatically reset upon completion of the regeneration sequence.

3. The controller shall include a sealed keypad, capable of programming all controller functions, located inside the controller enclosure. The controller display shall be a multi-line OLED display capable of full text readouts of operating status and codes.
4. An audible alarm beeper capable of emitting a tone of ~70 dBA shall be available but capable of being disabled if so desired.
5. The controller shall allow for a manual initiation of the automatic regeneration sequence by utilizing a regeneration selection from the controller program.
6. The controller shall operate on a low voltage electrical system. The system shall include a UL/CUL listed transformer. The entire electronic control package and its associated inputs/outputs shall require not more than 24 VAC @ 100VA.
7. The controller shall utilize EEPROM to save pertinent programmed data and statistical functions. The controller must retain all functionality for power interruptions of less than 12 hours. A battery backup shall be installed and capable of maintaining the time of day for a minimum of 5 years.

H. System Control Options:
1. An operator selected program of immediate or delayed volume initiated regeneration for single units shall be available. The controller shall be capable of being entirely programmed in the field without additional interface devices. The electronic controller shall indicate various data that includes flow rate, capacity remaining, total flow since installation, number of regenerations in the last 14 days, days since the last regeneration, total number of regenerations for the life of the unit, time of day, and unit in regeneration.
2. In addition the following functions shall be provided as part of the system controller:
    a. Regeneration sequence timers: The controller shall allow control customization of individual regeneration cycle times, each programmable from 1 - 99 minutes. The regeneration cycle and time of cycle remaining shall be displayed when in regeneration.
    b. Lockout function: The controller shall include a lockout to prevent unauthorized personnel from altering program data.
    c. Regeneration override: The controller shall include a function to direct pre-programmed regeneration after a user determined period of time (hours or 24 hour intervals) without an input signal from another regeneration initiation device.
    d. Alarm status indicator: The controller shall monitor operation of internal functions. If a fault is identified, the need for operator intervention will be signaled visually within the controller display.
    e. Two Auxiliary Outputs: Two Auxiliary Outputs shall be integral to the controller circuit board. Each Output shall be capable of being programmed to provide power to a "Normally Open" or "Normally Closed" contact (user choice). These 24VAC outputs shall be used only for the purpose of energizing a relay coil.
    f. Flow rate indication: The controller shall be capable of indicating the flow rate of the treated water.
    g. Totalizer: The controller shall include a totalizer function and a display capacity to 99,999,999 units before resetting to zero. The totalizer value shall be displayed through the controller display during operation.

I. Flow Sensor(s):
1. A flow sensor package shall be provided consisting of an insertion-type Hall Effect flow transducer with an appropriately sized installation fitting; the package shall include a total of one (1) flow sensor(s) with fittings.
2. The fitting provided shall be 2.0 inches, compatible with the specified piping. It will be designed to allow ease of removal of the sensor for inspection without modification of the piping system. A 15 foot length of cable shall be provided for direct connection to the system controller.
3. The flow sensor package provided shall be functional within the flow range of 1.5 to 150.0 gpm and will be provided with a 2.0" flow sensor installation fitting.
4. The operating temperature/pressure range of flow sensor fittings shall be 34°-100°F at 100.0 psi max.

5. The wetted surfaces of the flow sensor shall be constructed of non-corroding materials such as polypropylene, black Polyvinylidene (PVDF) and titanium.
6. The flow sensor shall have an accuracy to 1% over full range and repeatability to +/-0.5% of full range.

J. Exchange Resin:
1. The ion exchange resin shall be virgin high capacity "standard mesh" of sulfonated polystyrene type stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. The resin shall be solid, U.S. standard screen and will contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resin shall be manufactured to comply with the food additive regulation 21 CFR 173.25 as set forth by the USFDA.

K. Brine System:
1. Provide a complete brine system consisting of a plastic tank, cover, salt platform, brine well, an automatic brine valve and all necessary fittings for operation with the water softening system. The system shall consist of a combined brine measuring and salt storage tank with salt platform. The system will include a total of one (1) brine tank(s).
2. The brine tank will be equipped with a float operated non-corrosive field serviceable brine float valve for automatic control of brine withdrawal and fresh water refill.
3. The brine valve will automatically open to admit brine to the resin tank during eduction and close automatically providing positive shut-off to prevent air from entering the system. The brine valve will also regulate the flow of soft water into the brine tank during refill. The brine valve works with the timed fill feature of the main operating valve controls to admit the correct volume of fresh water to the brine tank in accordance with the refill time setting in the control program. The brine valve will include a float operated safety shut-off valve as a back up to the timed refill from the main operating valve control to prevent brine tank overflow.

L. Accessories:
1. Water test kits for hardness tests will be supplied.
2. Pressure Gauges for hard water inlet and soft water outlet.
3. Sampling Cocks for hard water inlet.

M. Instructions:
1. One (1) complete sets of installation, operating and maintenance manuals shall be provided.

N. Field Service:
1. The services of a factory authorized service representative can be made available to supervise, inspect and provide operator training as required for initial start-up and system operation. Contact your local Culligan dealer for service rates and scheduling.

2.05 IN-LINE CIRCULATOR PUMP

A. Manufacturer:
1. B & G
2. Taco
3. Grundfos
4. Engineer approved equal.

B. Performance: See schedule on drawings.

C. Casing: Bronze, rated for 125 psig working pressure.

D. Impeller: Bronze or stainless steel.

E. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

F. Seal: Carbon rotating against a stationary ceramic seat.

G. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate with plumbing piping and related fuel piping, gas venting, and, electrical work to achieve operating system.

C. Install unit with clearance for removal without disturbing other installed equipment or piping.

D. Pipe relief valves and drains to nearest floor drain.

E. Install flue vent system as indicated on the drawings and in accordance to manufacturer's recommendations.

F. Install power vent as per manufacturer's instructions.

G. Insulate vent and intake piping in attic space in accordance to manufacturer's recommendations.

3.02 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ensure shaft length allows sump pumps to be located 25 inch minimum below lowest invert into sump pit and six inch (6") minimum clearance from bottom of sump pit.

C. Provide air cock and drain connection on horizontal pump casings.

D. Provide line sized isolating valve and strainer on suction.

E. Provide line sized soft-seated check valve and balancing valve on discharge.

F. Decrease from line size with long radius reducing elbows or reducers.

G. Support piping adjacent to pump such that no weight is carried on pump casings.

H. Provide supports under elbows on pump suction and discharge line sizes four inch (4") and over.

I. 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% of midpoint of published maximum efficiency curve.

J. Install aquastat on hot water recirculation pipe to control water heater re-circulation pump.

K. Low voltage wiring shall be by the mechanical contractor unless otherwise noted.

3.03 WATER SOFTENER INSTALLATION

A. Install as per manufacturer's instructions.

B. Connect cold hard water, soft cold water, and brine piping to unit.

C. Pipe back flush to floor drain with standpipe.

3.04 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

A. This contractor shall furnish all connections to equipment furnished by the owner.

B. This equipment shall include, but not be limited to the following:
   1. Air compressor.
   2. Washer.
   3. Hose dryer.
   4. Shop vac.
   5. Power washer.
   6. Hotsy water heater and accessories.

END OF SECTION 22 30 00

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. See plumbing fixture schedules on drawings.

1.02 RELATED SECTIONS

A. Specification Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment

B. Specification Section 22 1116 - Domestic Plumbing Piping

C. Specification Section 22 1119 - Domestic Plumbing Specialties

D. Specification Section 22 3000 - Plumbing Equipment

1.03 REFERENCES

A. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment

B. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers

C. ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use

D. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings

E. ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures

F. ASME A112.19.2 - Vitreous China Plumbing Fixtures

G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use)

H. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures

I. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals

J. NFPA 70 - National Electrical Code

K. NSF/ANSI 61 - Drinking Water System Components - Health Effects

L. NSF/ANSI 372 - Drinking Water System Components - Lead Content

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data: Provide catalog illustrations of fixtures, sizes, rough in dimensions, utility sizes, trim, and finish.
      b. Installation Instructions
      c. Note: The mechanical contractor shall coordinate all fixtures with general construction and cabinetry prior to submitting for review.

C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Operation and Maintenance Information, including fixture trim exploded view and replacement parts lists.
      b. Warranty: Submit manufacturer warranty and ensure forms have been completed in owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

B. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

A. Provide manufacturer's standard warranty for electric water cooler.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks prior to ordering.

D. Confirm that hole drillings are of appropriate number and spacing for trim.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid or flexible supplies to fixtures with 1/4 turn loose key stops, reducers and escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall supports or wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant. Color to match fixture.

G. Solidly attach water closets to floor with lag screws. Flashing is not intended to hold fixture in place.

H. Coordinate electronic faucet under deck mixing valve and control module installation such that they do not extend passed the footprint of the plumbing fixture. The control module shall be installed over the low voltage junction box.

I. Water Coolers: Confirm mounting height of all water coolers with the architect and AHJ prior to rough in.

J. Water Coolers: Power source shall be a GFCI circuit breaker. A GFCI receptacle is not permissible. Coordinate with the electrical contractor.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

END OF SECTION 22 40 00

SECTION 23 00 50
BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic HVAC Requirements specifically applicable to Mechanical Division Specification Sections.

B. Division 23 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 OWNER OCCUPANCY

A. The owner will occupy the premises during the construction period.

B. Limit use of site and premises to allow owner occupancy.

C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

D. Schedule the work to accommodate this requirement.

1.03 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by themselves, by their employees or through any operation under their charge, whether in the contract or extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:
   1. The National Board of Fire Underwriters
   2. American Gas Association
   3. The National Fire Protection Association (NFPA)
   4. The Occupations Safety and Health Act (OSHA)
   5. Current IBC Building Code
   6. Current applicable city building codes.
   7. Current International Energy Conservation Code

F. Mechanical: Conform to current mechanical code.

G. Plumbing: Conform to current plumbing code.

H. Obtain permits and request inspections from authority having jurisdiction.

1.04 PROJECT/SITE CONDITIONS

A. Install work in locations shown on the drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.

C. This contractor, before submitting their bid, shall visit their the site of the project to familiarize themselves with locations and conditions affecting their work.

D. It is the intent of this specification that the contractor furnishes all labor and material required completing the installation as outlined in the drawings and specifications. No additions to the

contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing piping, ductwork, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.

F. This contractor shall provide holes as necessary for the installation of their work and in accordance with other specification sections in materials other than the structure.

1.05 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to ensure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.06 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment, nor any provisions in the contract documents, nor partial or complete occupancy of premises by owner, nor substantial completion of the work, shall constitute an acceptance for work not done in accordance with contract documents, or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.07 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.08 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction, this contractor shall check and verify with the owner each item of existing equipment that must be removed.

B. The owner will designate which items of material or equipment not reused that they may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for their use shall become the property of the contractor and shall be removed from site.

1.09 PROTECTION AND MAINTENANCE

A. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

B. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

C. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of their work.

D. Coordinate protection requirements with department heads before beginning construction.

E. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.10 DEMOLITION

A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.
   4. All elements to be removed are subject to the Owner's Right of Salvage.

B. Preserve services to the existing facility. Extend/reroute/reconnect existing systems as required providing for the continued function of these systems.

1.11 TEMPORARY HEATING, VENTILATION, AND AIR CONDITIONING

A. Coordinate provisions for temporary heating, cooling, ventilation, and/or dehumidification with the general contractor as required in Division 01.

B. Coordinate construction heating gas requirements with the utility company prior to the start of construction.

C. If permanent HVAC units are to be operated prior to substantial completion, the mechanical contractor shall take steps as necessary to prevent construction dust and debris from entering the HVAC system and preserve the manufacturer’s warranty.
   1. The general and mechanical contractors shall receive permission from the owner and architect in writing prior to operating the permanent HVAC equipment.
   2. At no point shall the permanent HVAC system be in operation during installation and sanding of drywall, grinding of floors, or any other construction activities that generate dust.
      a. For existing systems that serve other spaces that must remain active, close off all supply, return, and exhaust grilles/diffusers in the space where dust-generating activities are taking place. Only after the dust has settled and the affected space has been cleaned can grilles/diffusers be put back into service.
   3. Install temporary filters with a minimum efficiency of MERV 8 on all return and/or exhaust grilles and louvers. Check filters on a weekly basis and replace as necessary and as directed by the owner or architect.
   4. Install temporary MERV 8 filters in all air handling equipment. Check filters on a weekly basis and replace as necessary and as directed by the owner or architect. Replace all filters after substantial completion with new filters.
   5. This contractor shall be responsible for any maintenance or warranty items prior to substantial completion if equipment is used for temporary space conditioning.

D. On projects with multiple phases, the contractor shall assist the owner in developing a filter checking and replacement schedule for areas that are complete. This shall be done to prevent construction dust from plugging filters in finished areas. The owner shall be responsible for providing replacement filters.

1.12 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of their work in all existing and new buildings unless otherwise noted.

B. This contractor shall arrange for openings in the building as required for the installation of equipment furnished under this contract. Where ductwork and piping must be extended or changed, patching with concrete will be done in the building. Patching shall be at both the top and bottom of sleeves where above grade.

C. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, contractor shall be responsible to patch and/or seal openings as necessary to maintain/return fire separation to rating as required by applicable codes.

D. This contractor shall do all cutting and patching required for their work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

A. The Contractor shall coordinate with the owner special cleaning requirements and acceptable routes for transporting building material and rubbish removal.

B. Hazardous waste shall not be disposed of using sanitary or storm drains, or owner's waste disposal facilities. Hazardous waste shall be removed from the project site and lawfully disposed of at the contractor's expense.

C. Daily Requirements:
   1. The Contractor shall maintain the work area each day to prevent hazardous accumulation of waste from the work site.
   2. At the end of each working day, the contractor shall remove all their debris, rubbish, tools, and surplus materials from the project work area. The work area shall appear broom clean and left in a neat and orderly condition. The contractor for the removal of debris from the project shall not use the owner's waste disposal facilities.
   3. All equipment shall be cleaned, and the premises left in excellent condition, free of dirt, debris, dust, grease, oil.

D. End of Project Requirements:
   1. The Contractor, upon completion of their work, shall remove all rubbish and debris resulting from their operation and shall remove it from site at their own expense.
   2. At the end of construction, all equipment and surfaces in the project area shall be left in a clean condition. Except for protective coatings and surfaces, equipment shall be cleaned to be free of dirt, dust, debris, oil, and grease. Fingerprints, palmprints, and footprints shall be cleaned from visible surfaces. Equipment rooms shall have surfaces cleaned, floor shall be broom clean and mopped. Spaces that are to be occupied within the work area shall have all surfaces dusted, cleaned, and disinfected. Floors shall be vacuum cleaned and mopped (if applicable).

1.14 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
   1. Dow Corning "Silicone RTV Foam"
   2. 3-M Corporation "Fire Barrier Caulk and Putty"

3. Thomas & Betts "Flame Safe Fire Stop System"

D. Installation of these products to be in strict accordance with manufacturer's recommendations and architectural specification sections or equivalent fire stopping architectural specification section.

E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 ELECTRICAL CONNECTIONS

A. This contractor shall turn over all magnetic starters, thermal protective switches, and speed changing switches furnished under this contract for all motor driven equipment to the electrical contractor who will install such starters and switches and wire them to their respective motors as a part of the electrical contract.

1.16 UTILITY COMPANY

A. Any fees by the utility company are to be billed directly to the owner.

B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.17 HAZARDOUS MATERIALS

A. If the contractor stores any hazardous solvents or other materials on the site, they shall obtain copies of the safety data sheets for the materials and post them on the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.
   1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.18 RECORD DRAWINGS

A. This contractor shall provide at the conclusion of the project one clean, non-torn, neat, and legible "as-built" set of drawings to the owner. These drawings shall show the routing of pipes, ductwork and equipment drawn in at scaled locations. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.

B. All mechanical systems installed shall be shown on the "as-built" drawings. This includes all addendum items and change orders.

C. Refer to respective architectural specification section for additional information.

D. This contractor shall update these drawings during the project at least every week.

1.19 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials and equipment they propose to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions and illustration. One of these returned copies shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless the contractor notifies engineer in writing of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set that they have checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.20 TEST OF SYSTEMS

A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall be held responsible for all damage resulting from defects in the system.

C. At the conclusion of construction (before any covering up, painting or finishing) each element of the system shall be thoroughly tested against leakage, with appropriate pressure tests, as outlined herein and in appropriate sections of the specifications. All testing shall be hydrostatic unless permission is granted otherwise.
   1. Water: 100 psi maintained 8 hours
   2. Under Floor Pipes: 200 psi maintained 8 hours

D. Fluid lines other than the above 1.5 times operating with a minimum pressure of 60 psig.

E. After completion of installation, the systems shall be given tests under full operating conditions and pressures and all adjustments shall be made to make the system operative as required. All safety devices shall be tested for correct operation.

1.21 SCOPE OF WORK

A. All work shall be performed by well-qualified and licensed mechanics with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their mechanics are familiar with all the various codes and tests applicable to this work.

B. All equipment shall be new and of the type as specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

C. The intent of the drawings and specifications is for complete installation of the systems outlined in the drawings and specifications so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.

D. This contractor shall be required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The drawings and specifications cannot deal individually with the many minute items that may be required by the nature of the systems.

E. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer’s attention and an addendum is issued for clarification.

F. The HVAC Contractor shall establish system elevations prior to fabrication and installation. The HVAC Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate
   3. Electrical bus duct
   4. Sheet metal
   5. Cable trays, including access space
   6. Other piping
   7. Conduits and wireway

1.22 VERIFICATION OF ELEVATION OF EXISTING LINES

A. This contractor shall before starting any new work, verify the elevations of all existing piping to which they must connect under this contract. The contractor shall report any discrepancies between drawing elevations and actual elevations to the engineer before proceeding with the

work. Failure of the contractor to do so shall make them liable for the cost of extra work involved.

1.23 WELDING PERMIT

A. Form titled "Permit For Cutting and Welding With Portable, Gas or Arch Equipment" must be completed and returned to the hospitals designated representative prior to work commencing. The owner, upon request, will supply this form.

1.24 CLEANING OF MECHANICAL SYSTEMS

A. Where connections are made to existing piping systems, this contractor shall provide isolation valves, threaded tees, etc., as required to facilitate the cleaning and testing of all new piping.

B. This contractor shall thoroughly clean all rust, grease, plaster, cement, etc., from all equipment, ductwork and piping furnished and installed by them as required to leave surfaces suitable for finish painting.

C. This contractor shall keep all pipes, ducts, etc., plugged, drained or otherwise protected during construction. All items of mechanical equipment shall be suitably protected and upon completion of project shall be equal to new condition.

1.25 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. Prior to digging, all underground utilities, piping, etc shall be exactly located and marked. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional requirements.

1.26 ALTERNATES

A. Refer to General Specification Sections for alternate bid description.

1.27 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.28 SECURE NETWORKABLE DEVICES

A. Update network devices to the most current software/firmware.

B. Change default password of all networkable devices.
   1. Passwords shall have at least eight characters.
   2. Include uppercase and lowercase letters, numerals, and special characters

C. Supply MAC address and serial number of all networkable devices.

D. Work with the Owner’s IT department to align to existing IT standards.

E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.29 SYSTEM CONFIGURATION AND PROGRAMMING FILES

A. Supply system configuration and programming files where export is available.

B. Supply uncompiled programming for systems applicable.

C. All configuration and programming shall be property of the owner at conclusion of the project.

1.30 COMMISSIONING REQUIREMENTS

A. [The owner has contracted directly with _____ to commission this project. Contact _____ for further information at _____.]

B. [The owner will contract directly with a commissioning authority for this project.]

C. Contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
   1. Construction Phase:
      a. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule (OPS).
      b. Provide detailed startup procedures.
      c. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
      d. Provide copies of all submittals as required in Section 01300 including all changes thereto. Attend and participate in commissioning team meetings.
      e. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and owner to finalize the detailed commissioning procedures/ schedule.
      f. Provide the training of owner personnel.
      g. Review and accept construction checklists provided by the commissioning authority.
      h. Complete paper construction checklists as work is completed and provide to the commissioning authority.
      i. Accomplish commissioning process test procedures.
      j. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
      k. Cooperate with the CxA for resolution of issues recorded in the “Issues Log”.
      l. Prepare O & M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
   2. Occupancy and Operations Phase
      a. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
      b. Ensure that subcontractors correct deficiencies and make necessary adjustments to O & M manuals and as-built drawings for applicable issues identified in any seasonal testing.
      c. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.

D. Vendors / Subcontractors
   1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the owner to keep warranties in force.
   2. Assist in equipment testing per agreements with subcontractors and/or contractor.
   3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
   4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
   5. Provide requested information regarding equipment sequence of operation and testing procedures.
   6. Review construction checklists and test procedures for equipment installed by factory representatives.

1.31 COMMISSIONING

A. See Specification Section _____ for commissioning requirements.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 23 00 50

SECTION 23 00 90

MINOR HVAC DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 23 00 50 - Basic Mechanical Requirements "General Provisions" apply to this section.

1.02 SCOPE

A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.

B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.

C. This contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.

D. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.

E. This contractor shall remove all abandon equipment, piping, ductwork, supports, equipment curbs, and bases associated with the remodeled areas unless noted otherwise.

F. This contractor is responsible to provide temporary HVAC protection during this project.

1.03 MATERIALS

A. All elements to be removed are subject to the Owner's Right of Salvage.

B. All materials removed shall be the property of the removing contractor and shall be removed from the site by them, unless otherwise specified.

C. The owner may designate and have salvage rights to any material herein demolished by this contractor. The contractor shall coordinate with the owner prior to start of demolition.

1.04 WORK BY OTHERS

A. Unless specifically noted under other contracts, this mechanical contractor shall assume they will perform all required work. In general, the following will be performed by others:
   1. The electrical contractor will disconnect all electrical service and remove conduit back to behind finished surfaces, close and cap ends of conduits.

1.05 EXISTING CONDITIONS

A. If any piping serving existing fixtures or equipment (that are to remain) are disturbed by operations under this contract, this contractor shall provide pipe and insulation required to re-establish continuity of such piping systems.

B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to the removal of equipment, piping, and ductwork.

C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.

D. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 23 00 90

SECTION 23 05 19
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges
B. Pressure gauge tappings
C. Stem type thermometers
D. Dial thermometers
E. Thermometer supports
F. Test plugs
G. Static pressure gauges

1.02 RELATED SECTIONS

A. Specification Section 23 09 13 - Instruments and Control Devices for HVAC
B. Specification Section 23 0933 - Direct Digital Control Systems for HVAC
C. Specification Section 23 09 93 - Sequence of Operation for HVAC Controls

1.03 REFERENCES

A. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element
B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi
C. ASTM E1 - Standard Specification for ASTM Thermometers
D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers
E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service
F. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data, indicating use, operating range, total range, accuracy, and location for manufactured components.
C. Closeout submittal
    1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Operation and Maintenance Information, including calibration instructions
D. Project Record Documents
    1. Final installed locations of all components on a PDF floor plan

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install instruments when areas are under construction, except for required rough in, taps, support, and test plugs.

1.06 MAINTENANCE PRODUCTS

A. Supply two bottles of red gauge oil for static pressure gauges.

1.07 EXTRA MATERIALS

A. Supply two pressure gauges with pulsation dampener and dial thermometers.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Ametek/US Gauge Series 1980
   2. Trerice
   3. Miljaco Corp.
   4. Weiss Instruments
   5. Dwyer
   6. Winters Instruments
   7. Engineer approved equal.

B. Gauge: Install where indicated on the drawings, 4.5 inch dial size pressure gauge, phenolic solid front pressure relieving case, Grade 2A, +/- 0.5% accuracy with range approximately twice working pressure.

C. All gauges to be fitted with gauge cocks.

2.02 PRESSURE GAUGE TAPPINGS

A. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.

B. Ball Valve: Brass 1/4 inch NPT for 250 psi.

C. Pulsation Damper: Pressure snubber brass with 1/4 inch NPT connections.

D. Siphon: Steel, Schedule 40, 1/4 inch NPT angle or straight pattern.

2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Weiss #9VU
   2. Trerice
   3. Miljaco
   4. Engineer approved equal.

B. Thermometer: ASTM E1, blue organic-filled glass tube, lens front tube, cast aluminum case with enamel finish.

C. Size: Six inch (6") scale where less than six foot (6') above floor, nine inch (9") scale where higher than six feet (6') above floor.

D. Window: Polyester/glass mixture or acrylic.

E. Stem: Aluminum, 3/4 inch NPT, 3-1/2 inch.

F. Accuracy: Two percent.

G. Range: Approximately 20% greater than expected operating temperature.

H. Calibration: Degree F.

I. Accessories: Manufacturer's 3-1/2 inch stem lead-free thermowell.

2.04 DIAL THERMOMETERS

A. Manufacturers:
   1. Weiss #5VBM
   2. Trerice
   3. Miljaco
   4. Winters Instruments.
   5. Engineer approved equal.

B. Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem and variable angle face.

C. Size: Three inch (3") diameter dial.

D. Lens: Clear glass.

E. Accuracy: One percent.

F. Range: Approximately 20% greater than expected operating temperature.

G. Calibration: Degree F.

H. Accessories: Manufacturer's lead-free thermowell.

2.05 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stem with or without extensions as required.

B. Flange: Outside three inch (3") diameter reversible flange, designed to fasten to sheet metal air ducts with brass perforated stem.

2.06 TEST PLUGS

A. Test Plug: Brass 1/4 inch fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 deg F.

2.07 STATIC PRESSURE GAUGES

A. Dial Gauges: Dial 3-1/2 inch diameter in metal case, diaphragm actuated, black figures on white background, front re-calibration adjustment, and 2% of full-scale accuracy.

B. Manufacturers:
   1. Weiss #9VS3-1/2
   2. Trerice
   3. Miljaco
   4. Engineer approved equal.

C. Inclined Manometer: Plastic with red liquid on white background with black figures, front re-calibration adjustment, 3% of full-scale accuracy.

D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install one pressure gauge per pump with taps before strainers and on suction and discharge of pump; pipe to gauge.

B. Install gauge taps in piping.

C. Install pressure gauges with pulsation dampeners. Provide ball valve to isolate each gauge. Install siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter or sensor sockets. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

G. Locate duct mounted thermometers minimum ten foot (10') downstream of mixing dampers, coils or other devices causing air turbulence.

H. Coil and conceal excess capillary on remote element instruments.

I. Install static pressure gauges to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gauge.

J. Provide instruments with scale ranges selected according to service with largest appropriate scale.

K. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degree off vertical.

L. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

M. Locate test plugs adjacent to thermometers and thermometer sockets adjacent to pressure gauges and pressure gauge taps.

N. Refer to schematics and details on drawings for additional locations.

END OF SECTION 23 05 19

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers and supports
B. Accessories
C. Flashing
D. Equipment bases
E. Sleeves

1.02 RELATED SECTIONS

A. Specification Section 23 23 00 - Refrigerant Piping

1.03 REFERENCES

A. ASME B31.1 - Power Piping
B. ASME B31.2 - Fuel Gas Piping
C. ASME B31.5 - Refrigeration Piping
D. ASME B31.9 - Building Services Piping
E. ASTM F708 - Design and Installation of Rigid Pipe Hangers
F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer
G. MSS SP69 - Pipe Hangers and Supports - Selection and Application
H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data
        b. Design Data, indicating load capacity of hangers

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
    1. Anvil International
    2. Cooper B-Line/Tolco
    3. Engineer approved equal.
B. Refrigerant Piping:
    1. Conform to ASME B31.5 or ASTM F708.
    2. Hangers for Pipe Sizes 1/2" to 1-1/2": Carbon steel adjustable swivel, split ring.
    3. Hangers for Pipe Sizes 2" and Over: Carbon steel, adjustable, clevis.
    4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes to 3": Cast iron hook.
6. Wall Support for Pipe Sizes 4" and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
10. Exterior Support: Zinc coated Unistrut.
11. Provide stainless steel hangers and supports in locker rooms and other high humidity areas.
12. Provide zinc coated (hot dipped galvanized) hangers and supports for all exterior applications.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end or continuous threaded.

2.03 FLASHING

A. Metal Flashing: 26 gauge galvanized steel.

B. Metal Counter Flashing: 22 gauge galvanized steel.

C. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

E. Provide curbs for mechanical roof installations 14 inch minimum high above roofing surface unless noted otherwise. Flash and counterflash with sheet metal and seal watertight. Attach counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

2.04 EQUIPMENT BASES

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inch (6") beyond supported equipment.

2.05 SLEEVES

A. Sleeves for pipes through wall below grade shall be Schedule 40, two pipe diameters larger than pipe. Seal with Linkseal.

B. Sleeves for pipes through non-fire rated floors shall be 18 gauge galvanized steel.

C. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors shall be Schedule 40 steel pipe or 18 gauge galvanized steel.

D. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing to be a fire rated sleeve assembly including seals, UL listed.

E. Stuffing and Firestopping Insulation: Fiberglass type, non-combustible per UL tested assembly type.

F. Sealant Manufacturers:
1. Dow Corning Silicone RTV Foam.
2. 3-M Fire Barrier Caulk and Putty.
3. Thomas & Betts Flame Safe Fire Stop System.
4. Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. Provide copper plated hangers and supports for copper piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Support vertical piping every ten feet or on every floor.

3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond all floor supported equipment.

B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface unless noted otherwise. Flash and counterflash with sheet metal; seal watertight. Attach counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floor one inch (1") above finished floor level. Caulk sleeves.

D. Provide sleeves where piping penetrates floor, ceiling or wall fire rated assemblies. Close off space between pipe and adjacent work with fire stopping insulation and caulk.

E. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install chrome plated steel escutcheons at finished surfaces and within cabinets.

3.06 SCHEDULES

HANGER ROD	MAX. HANGER SPACING	DIAMETER
Pipe Size	**Feet**	**Inches**
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 to 6	10.0	5/8
8 to 12	14.0	7/8
14 and Over	20.0	1

END OF SECTION 23 05 29

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates

B. Tags

C. Pipe markers

D. Labels

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data, including a list of wording, symbols, letter size, and color-coding for mechanical identification.

C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Project Record Documents
   1. Record actual locations of tagged valves, including valve tag numbers.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 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. Information Tags: Clear plastic with printed "Danger, "Caution" or "Warning" and message; size 3-1/4" x 5-5/8" with grommet and self-locking nylon ties.

2.03 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6" W x by 4" mil thick, manufactured for direct burial service.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating flow direction arrow and identification of fluid being conveyed.

2.04 LABELS

A. Description: Laminated vinyl, size 0.75" adhesive backed with printed identification.

PART 3 EXECUTION

3.01 PREPARATION

A. De-grease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces for stencil painting.

3.02 INSTALLATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners or adhesive.

C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. Apply paint primer before applying labels for unfinished canvas covering.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Install underground plastic pipe markers six inch (6") to eight inch (8") below finished grade, directly above buried pipe.

F. Tag automatic controls, instruments, and relays. Key to control schematic.

G. Identify piping, concealed or exposed as indicated in schedule below. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction. Identify on both sides of any wall.

H. Identify ductwork 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.

I. Conform to owner's existing identification scheme. Verify with owner prior to bid.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems

1.02 REFERENCES

A. AABC - National Standards for Total System Balance

B. ADC - Test Code for Grilles, Registers, and Diffusers

C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems

D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems

E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing

1.03 SUBMITTALS

A. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Construction submittal (prior to commencing work)
   1. Provide (1) submittal including the following.
      a. Report forms or outlines indicating adjusting, balancing, and equipment data required.
      b. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty.

D. Closeout report submittal
   1. Provide report with set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   2. Provide final copies to Architect/Engineer and for inclusion in operating and maintenance manuals.
   3. Indicate test report data on AABC National Standards for Total System Balance Forms.

E. Project Record Documents
   1. Record actual locations of flow measuring stations, balancing valve, and rough setting.

1.04 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

B. Maintain one copy of each document on site.

1.05 QUALIFICATIONS

A. Independent agency specializing in the testing, adjusting and balancing of systems specified in this section with minimum three years experience.

B. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.06 PRE-BALANCING CONFERENCE

A. Convene a conference one week prior to commencing work of this section.

1.07 SEQUENCING

A. Sequence work to commence after completion of systems and schedule completion of work before substantial completion of project.

1.08 SCHEDULING

A. Schedule and provide assistance in final adjustment and test of life safety system with the fire authority.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. 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, smoke, 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 noted during performance of services that prevents system balance.

C. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within +/- 5% of design for supply systems and +/- 10% of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within + 10% and - 5% of design to space. Adjust outlets and inlets in space to within +/- 10% of design.

C. Hydronic Systems: Adjust to within +/- 10% of design.

3.04 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.05 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 extent those adjustments do not create objectionable air motion or sound levels. Affect the 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% loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inch positive static pressure.

M. Check multi-zone units for motorized damper leakage. Adjust air qualities with mixing dampers set first for cooling, then heating, and then modulating.

N. Set volume controller to airflow setting indicated for variable air volume system powered units. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

O. Adjust airflow switches for proper operation for water applications.

3.06 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing:
   1. Energy Recovery Units
   2. Forced Air Furnaces
   3. Unit Air Conditioners
   4. Air Handling Units
   5. Fans
   6. Air Filters
   7. Air Terminal Units
   8. Air Inlets and Outlets

B. Report Forms
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency
      b. Address of Testing, Adjusting, and Balancing Agency
      c. Telephone number of Testing, Adjusting, and Balancing Agency
      d. Project Name
      e. Project Location

f. Project Architect
g. Project Engineer
h. Project Contractor
i. Project Altitude
j. Report Date

2. Summary Comments:
   a. Design versus final performance.
   b. Notable characteristics of system.
   c. Description of systems operation sequence.
   d. Summary of out door and exhaust flows to indicate amount of building pressurization.
   e. Nomenclature used throughout report.
   f. Test conditions.
3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Range
   f. Calibration date
4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP
   d. Phase, voltage, amperage; nameplate, actual, no load
   e. RPM
   f. Service factor
   g. Starter size, rating, heater elements
   h. Sheave Make/Size/Bore
5. V-Belt Drive:
   a. Identification/location
   b. Required driven RPM
   c. Driven sheave, diameter and RPM
   d. Belt, size and quantity
   e. Motor sheave diameter and RPM
   f. Center to center distance, maximum, minimum, and actual
6. Pump Data:
   a. Identification/number
   b. Manufacturer
   c. Size/Model
   d. Impeller
   e. Service
   f. Design flow rate, pressure drop, BHP
   g. Actual flow rate, pressure drop, BHP
   h. Discharge pressure
   i. Suction pressure
   j. Total operating head pressure
   k. Shut off, discharge and suction pressures
   l. Shut off, total head pressure
7. Combustion Test:
   a. Boiler manufacturer
   b. Model number
   c. Serial number
   d. Fire rate
   e. Over fire draft

f. Gas meter timing dial size
g. Gas meter time per revolution
h. Gas pressure at meter outlet
i. Gas flow rate
j. Heat input
k. Burner manifold gas pressure
l. Percent carbon monoxide (CO)
m. Percent carbon dioxide (CO2)
n. Percent oxygen (O2)
o. Percent excess air
p. Flue gas temperature at outlet
q. Ambient temperature
r. Net stack temperature
s. Percent stack loss
t. Percent combustion efficiency
u. Heat output

8. Air Cooled Condenser:
   a. Identification/number
   b. Location
   c. Manufacturer
   d. Model number
   e. Serial number
   f. Entering DB air temperature, design and actual
   g. Leaving DB air temperature, design and actual
   h. Number of compressors
9. Cooling Coil Data:
   a. Identification/Number
   b. Location
   c. Service
   d. Manufacturer
   e. Air flow, design and actual
   f. Entering air DB temperature, design and actual
   g. Entering air WB temperature, design and actual
   h. Leaving air DB temperature, design and actual
   i. Leaving air WB temperature, design and actual
   j. Water flow, design and actual
   k. Water pressure drop, design and actual
   l. Entering water temperature, design and actual
   m. Leaving water temperature, design and actual
   n. Saturated suction temperature, design and actual
   o. Air pressure drop, design and actual
10. Heating Coil Data:
    a. Identification/Number
    b. Location
    c. Service
    d. Manufacturer
    e. Air flow, design and actual
    f. Water flow, design and actual
    g. Water pressure drop, design and actual
    h. Entering water temperature, design and actual
    i. Leaving water temperature, design and actual
    j. Entering air temperature, design and actual
    k. Leaving air temperature, design and actual
    l. Air pressure drop, design and actual

11. Electric Heat Duct:
    a. Manufacturer
    b. Identification/Number
    c. Location
    d. Model number
    e. Design kW
    f. Number of stages
    g. Phase, voltage, amperage
    h. Test voltage (each phase)
    i. Test amperage (each phase)
    j. Air flow, specified and actual
    k. Temperature rise, design and actual
12. Air Moving Equipment:
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Arrangement/Class/Discharge
    f. Air flow, specified and actual
    g. Return air flow, specified and actual
    h. Outside air flow, specified and actual
    i. Total static pressure (total external), specified and actual
    j. Inlet pressure
    k. Discharge pressure
    l. Sheave make/size/bore
    m. Number of belts/make/size
    n. Fan RPM
13. Return Air/Outside Air Data:
    a. Identification/Location
    b. Design air flow
    c. Actual air flow
    d. Design return air flow
    e. Actual return air flow
    f. Design outside air flow
    g. Actual outside air flow
    h. Return air temperature
    i. Outside air temperature
    j. Required mixed air temperature
    k. Actual mixed air temperature
    l. Design outside/return air ratio
    m. Actual outside/return air ratio
14. Exhaust Fan Data:
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Air flow, specified and actual
    f. Total static pressure (total external), specified and actual
    g. Inlet pressure
    h. Discharge pressure
    i. Sheave Make/Size/Bore
    j. Number of Belts/Make/Size
    k. Fan RPM
15. Duct Traverse:

a. System zone/branch
b. Duct size
c. Area
d. Design velocity
e. Design air flow
f. Test velocity
g. Test air flow
h. Duct static pressure
i. Air temperature
j. Air correction factor

16. Terminal Unit Data:
    a. Manufacturer
    b. Type, constant, variable, single, dual duct
    c. Identification/number
    d. Location
    e. Model number
    f. Size
    g. Minimum static pressure
    h. Minimum design air flow
    i. Maximum design air flow
    j. Maximum actual air flow
    k. Inlet static pressure
    l. Air temperature rise across reheat coil
17. Air Distribution Test Sheet:
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Area factor
    f. Design velocity
    g. Design air flow
    h. Test (final) velocity
    i. Test (final) air flow
    j. Percent of design air flow

END OF SECTION 23 05 93

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass (flexible duct wrap)

B. Fiberglass (duct liner)

1.02 RELATED SECTIONS

A. Specification Section 23 31 00 - HVAC Ducts and Casings

B. Specification Section 23 33 00 - Air Duct Accessories

1.03 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

D. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

E. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Fiberglass, Duct Lining Material)

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

G. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

H. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

J. ASTM C612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation

K. ASTM C1290: Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts

L. ASTM E2336: Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems

M. ASTM C1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

N. NAIMA National Insulation Standards

O. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

P. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Applicator Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.06 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

B. Identification: External duct insulation and factory insulated flexible duct shall be legibly printed or identified at intervals not greater than 36 inch with name of manufacturer, the thermal resistance R-value at the specified thickness; and the flame spread and smoke developed indexes of the composite material.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, protect and handle products to site.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 ENVIRONMENTAL REQUIREMENTS

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 FIBERGLASS (FLEXIBLE DUCT WRAP)

A. Manufacturers:
   1. Owens Corning
   2. Knauff
   3. Johns Manville
   4. CertainTeed
   5. Engineer approved equal.

B. Insulation: ASTM C1290; flexible, noncombustible blanket.
   1. "K" Value: ASTM C518, 0.27 at 75 deg F.
   2. Installed R-value (compressed to 25%) for 1-1/2": 4.5
   3. Maximum Service Temperature: ASTM C411; 250 deg F.
   4. Maximum Moisture Absorption: ASTM C1104; 5% by weight
   5. Density: 1.0 lb./cu. ft. (0.75 lb/cu ft for attic insulation)
   6. Microbial Growth: ASTM C1338; does not support the growth of mold, fungi and bacteria.
   7. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50

C. Vapor Barrier Jacket:
   1. Kraft paper reinforced with fiberglass yarn and bonded to aluminized film.
   2. Maximum Moisture Vapor Transmission: ASTM E96; 0.02 perm.

D. Vapor Barrier Tape Pressure sensitive tape approved by the manufacturer.

2.02 FIBERGLASS (DUCT LINER)

A. Manufacturers:
   1. Johns Manville Permacote Linacoustic
   2. Owens Corning
   3. CertainTeed Ultralite
   4. Knauff
   5. Engineer approved equal.

B. Insulation:
   1. ASTM C1071, flexible noncombustible blanket air surface coated with acrylic coating treated with ASTM G21 and G22 anti-microbial agent to resist growth.
   2. "K" Value: ASTM C518, 0.25 at 75 deg F.
   3. Maximum Service Temperature: 250 deg F.
   4. Maximum Velocity on Coated Air Side: 5,000 FPM
   5. Noise Reduction Coefficient: 0.50 or higher in accordance with ASTM C423. (1/2" thickness)
      a. Noise reduction coefficient will drive density for each manufacturer may vary by manufacturer to achieve.
   6. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50

C. Adhesive: Adhesive: ASTM C916 adhesive as recommended by manufacturer.

D. Liner Fasteners: Galvanized steel welded with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ductwork has been tested 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. Insulated Ductwork 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, expansion joints, reheat coils, and any other item exposed to ductwork air temperature.

C. Insulated Ductwork Conveying Air Above Ambient Temperature:
   1. Provide with standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Duct Liner Application:
   1. Adhere insulation with adhesive for 100% coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing. Pin length as required to limit compression of liner.
   3. Seal and smooth joints. Seal and coat all exposed edges.
   4. Seal liner surface penetrations with adhesive.

3.03 SCHEDULES

FIBERGLASS FLEXIBLE DUCT WRAP

DUCTWORK	THICKNESS
Supply Ducts	1-1/2"
Exhaust Ducts	1-1/2"
Relief Ducts	1-1/2"
Outside Air Intake Ducts	2"
Combustion Air Ducts	2"
Fire, Smoke, and Fire/Smoke Damper Sleeves	1-1/2"

FIBERGLASS DUCT LINER

DUCTWORK	THICKNESS
Transfer Ducts	1/2"

END OF SECTION 23 07 13

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation (refrigerant)

B. Piping jackets

C. Insulation blankets

D. Insulation Shields

1.02 RELATED SECTIONS

A. Specification Section 23 2300 - Refrigerant Piping

1.03 REFERENCES

A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement

E. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block

F. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement

G. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

H. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

I. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation

J. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation

K. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation

L. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

M. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

N. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

O. ASTM D1667 - Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers

P. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

Q. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics

R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

S. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

T. NAIMA National Insulation Standards

U. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density and thickness.

1.08 ENVIRONMENTAL REQUIREMENTS

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 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Armacell: AP Armaflex
   2. Aerocel
   3. K-flex
   4. Engineer approved equal.

B. Insulation: ASTM C534 flexible cellular elastomeric molded foam

C. "K" Value: ASTM C177 or C518; 0.27 at 75 deg F.

D. Minimum Service Temperature: -40 deg F.

E. Maximum Service Temperature: 220 deg F.

F. Maximum Moisture Absorption: ASTM D1056, 5.0% by weight gain

G. Maximum Water Vapor Permeability: ASTM E96; 0.05 perm-in

H. Maximum Flame Spread: ASTM E84; 25

I. Maximum Smoke Developed: ASTM E84; 50

J. Insulation Protection
   1. Insulated Inserts:
      a. Description: 360 degree cylindrical insert provided by insulation manufacturer capable of supporting the piping system at each hanger location.
      b. Material: High density foam, with EPDM/Polymer outer membrane
      c. Compressive Strength: 130 psi
      d. Thermal Conductivity: 0.312 k-factor or less. ASTM C-518

e. Surface Burning: Self Extinguishing (ASTM D-635)
f. Vapor Barrier Jacket: Acrylic jacket with self sealing lap tape.
g. Permeability (Membrane): 0 Perm-in (ASTM-E96)
h. Service Temperature (fluid temp): 0F to 170F

2. Insulation Couplings:
a. Manufacturer: Hydra-Zorb Klo-Shure 7-Series or engineer approved equal.
b. Description: Rigid thermoplastic coupling that supports the pipe independent of insulation and provides a vapor barrier.
c. Material: TPO and steel
d. Surface Burning: UL Classified 2043 (25/50)
e. Operating Temperature: -50F to 200F

K. Elastomeric Foam Adhesive:
1. Manufacturers:
a. Armstrong #BLV 520
b. Halstead/K-Flex
c. Aeroflex
d. Engineer approved equal.
2. Air-dried contact adhesive, compatible with insulation
3. VOC Content: 0 g/L as calculated and reported by SCAQMD 1168

2.02 PIPING JACKETS

A. PVC Plastic:
1. Manufacturers:
a. Johns Manville Zeston
b. Owens Corning
c. PIC plastics
d. Engineer approved equal.
2. Jacket: ASTM C921, UV resistant one piece molded type fitting covers and sheet material, off white color.
3. Minimum Service Temperature: -40 deg F.
4. Maximum Service Temperature: 150 deg F.
5. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
6. Maximum Flame Spread: ASTM E84; 25
7. Maximum Smoke Developed: ASTM E84; 50
8. Thickness: 20 mil for indoor applications, 30 mil for outdoor applications
9. Connections: Brush on welding adhesive.
10. Covering Adhesive Mastic Manufacturers:
a. Johns Manville Perma-Weld
b. Engineer approved equal.
11. Compatible with insulation.

2.03 INSULATION BLANKETS

A. General: Factory fabricated removable and reusable covers for strainers, auto-flows, compensators, circuit setters, balancing valves and combination valves.

B. Re-Usable Wraps
1. Manufacturers:
a. No Sweat Valve Wraps
b. Engineer approved equal.
2. Cover: Flexible Tychem material coated with polyethylene. Secured with Velcro closure.
3. Insulation: Fiberglass inserts to match scheduled insulation thickness.
4. "K" Value: ASTM C177, 0.28 at 100 deg F.
5. Service temperature: 0-400 deg F
6. Moisture Vapor Transmission: ASTM E96, 0.01 perm
7. Flame Spread: ASTM E84; <25

8. Smoke Developed: ASTM E84; <50
9. Systems: Chilled, Hot, Geothermal supply and return on piping 6" and smaller. Provide blankets on strainers, auto-flows, compensators, circuit setters, balancing valve and combination valves.

2.04 INSULATION PIPE SHIELDS

A. Manufacturers
   1. Buckaroos
   2. PHD
   3. Ferguson
   4. Eaton B-line
   5. Engineer approved equal

B. Description: 180 degree pipe insulation shield to evenly disperse the weight of the piping system. Edges shall be flared to prevent insulation punctures.

C. Material: G60 Galvanized Steel, 20 gauge (18 gauge on saddles larger than 8" OD)

D. Length:
   1. Insulation OD of 8" and smaller: 12" length
   2. Insulation OD of 10" and larger: 18" length

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 materials in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Dual Temperature Pipes or Cold Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory applied or field applied.
   2. Insulate fittings, joints and valves with molded insulation of like material and a thickness as adjacent pipe.
   3. PVC fitting covers may be used.
   4. Continue insulation through walls (unless in firewall sleeves), pipe hangers and other pipe penetrations.
   5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
   6. Vapor seal insulation ends every 20 feet.

D. Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets with vapor barrier, factory applied.
   2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe.
   3. PVC fitting covers may be used.
   4. Hot piping conveying fluids 140 deg F or less do not insulate flanges and unions at equipment, but level and seal ends of insulation.
   5. Hot piping conveying fluids over 140 deg F, insulate flanges and unions at equipment.

E. Shields: Provide insulation shields at every hanger location.

F. Insulation shall be continuous at all hangers. Insulated inserts shall be used to prevent direct contact between pipe and hanger.

G. Insulation shall be continuous through all wall, roof and curb penetrations.

H. 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.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10% at normal conditions, as materials indicate.

3.04 SCHEDULE

FIBERGLASS INSULATION

FLEXIBLE ELASTOMERIC FOAM INSULATION

PIPING SYSTEMS	PIPE SIZE	THICKNESS
Refrigerant Suction Lines:	ALL	1"
Refrigerant Liquid Lines:	ALL	1"
Refrigerant Hot Gas Bypass Lines:	ALL	0.75"
VRF Liquid Lines:	ALL	1"
VRF Gas Lines (Low and High Pressure):	ALL	1"

A. Note: Pre-insulated refrigerant piping from the manufacturer shall be approved for use. Provide inserts and supports as specified.

B. Note: Refer to VRF manufacturer installation instructions for more stringent requirements.

PIPE JACKET SCHEDULE

PIPE LOCATION	JACKET MATERIAL
Piping in Mechanical/Electrical/Storage Rooms within 10' of floor (excluding racked piping)	PVC
Exterior Roof Piping	Aluminum
Exterior Piping	Aluminum
All other piping exposed to UV rays	PVC

C. Note: Jacketing shall cover the entire piping system including, but not limited to the pipe, joints, fittings and tees.

END OF SECTION 23 07 19

SECTION 23 11 23
NATURAL GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Natural gas piping
B. Gas control vents
C. Flanges, unions, and couplings
D. Gas pressure regulators
E. Plug valves
F. Gas ball valves

1.02 REFERENCES

A. ANSI LC-4/CSA 6.32 Press-connect Metallic Fittings for Use in Fuel Gas Distribution Systems
B. ASHRAE 90A - Energy Conservation in New Building Design
C. ASME Section 8D - Pressure Vessels
D. ASME B16.3 Standard for Malleable Iron Threaded Fittings: Classes 150 and 300
E. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
F. ASTM A420 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
G. NFPA 30 - Flammable and Combustible Liquids Code
H. NFPA 54 - National Fuel Gas Code
I. NFPA 70 - National Electrical Code

1.03 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data
C. Project Record Documents
    1. Indicate final installed locations of all valves on a PDF floor plan

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three-years experience.
B. All welders shall be certified under ASME Section IX.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store, protect and handle products to the site.
B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING (BURIED WITHIN 5 FEET OF BUILDING)

A. Steel Pipe:
   1. ASTM A53 Schedule 40 black.
   2. Fittings: ASTM A234/A234M, forged steel welding type.
   3. Joints: ASME B31.1, welded.
   4. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape.

2.02 NATURAL GAS PIPING (ABOVE GRADE)

A. Steel Pipe:
   1. ASTM A53 Schedule 40 black.
   2. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
   3. Joints: NFPA 54, threaded or welded to ANSI B31.1.

2.03 NATURAL GAS PIPING (BELOW BUILDING SLAB AND NON-ACCESSIBLE LOCATIONS)

A. Pre-sleeved Corrugated Stainless Steel Tubing (CSST) (Up to 2")
   1. Manufacturers:
      a. Omega Flex TracPipe #PS-11
      b. Engineer approved equal.
   2. Use pre-sleeved TracPipe #PS-II system or other sleeve configuration meeting code requirements and acceptable to the local administrative authority.
   3. TracPipe #PS-II shall consist of TracPipe CSST sleeved with a black integral polyethylene sleeve. The external sleeve shall designed to withstand superimposed loads. The external protective sleeve shall have internal vent channels lengthwise to direct any leakage along the pipe to vent fittings. This pipe shall be vented directly to the atmosphere.
   4. Follow plumbing, mechanical and fuel gas code requirements for encasement within a conduit and venting to atmosphere.

2.04 GAS CONTROL VENTS

A. All gas control vents shall be vented separately to the exterior of the building. Terminate with screwed vent cap.

2.05 FLANGES, UNION, AND COUPLINGS

A. Pipe Size Under 2 Inches:
   1. Ferrous Pipe: Class 150 psig malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 psig bronze unions with soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.06 GAS PRESSURE REGULATORS

A. Manufacturers:
   1. Fisher
   2. Engineer approved equal.

B. Direct-operated, spring-loaded regulator with internal relief. Regulator shall have internal relief across diaphragm to minimize overpressure. Any outlet pressure above the start-to-discharge point of the nonadjustable relief valve spring shall be allowed to bleed out through a relief vent.

2.07 PLUG VALVES

A. Up To and Including 2 Inches:
   1. Manufacturers:
      a. Homestead Valve #612
      b. Engineer approved equal.

2. Full port body, lubricated plug type, without taper, close tolerance between plug and body sealing surfaces, Teflon reinforced stem seal, leak-proof spring loaded check valve, combination lubricant screw and button head. Valve plugs shall be floated on low-friction Teflon surfaces. Lubricant system shall have sufficient pressure to force lubricant over all seating surfaces.
3. Valves shall handle natural gas at temperature and pressure indicated.

2.08 GAS BALL VALVES

A. Up To and Including 2 Inches:
   1. Manufacturers:
      a. Apollo #80-100
      b. Watts #B-6000-UL
      c. Nibco #T-580-70-UL
      d. Engineer approved equal.
   2. Bronze two piece body, standard or full port, chrome plated ball, Teflon seats and stuffing box ring, lever handle, threaded ends. UL listed for natural gas service.

PART 3 EXECUTION

3.01 INSTALLATION

A. Where CSST is used, the contractor shall have the tubing manufacturer provide sizing information to ensure the proper equivalent hydraulic diameter is provided.

B. This contractor shall furnish all labor and material necessary to install gas piping to all items of equipment shown on the drawings as requiring gas.

C. Accessible piping smaller than two inch (2") may be screwed.

D. All concealed gas pipe and all gas piping two inch (2") and larger shall be fabricated using weld type fittings.

E. All steel gas piping buried in earth shall be Schedule 40 black steel mill wrapped and all joints shall be welded.

F. Underground joints shall be wrapped with Minnesota Mining and manufacturing Scotchwrap.

G. All gas piping shall be tested at 50-psi air pressure for a 24-hour period.

H. This contractor shall furnish and install a gas cock shut off in the branch line to each gas-consuming piece of equipment. Provide plug valves where noted on the plans.

I. This contractor shall begin at the meter and shall run gas piping to all gas using equipment as shown on the drawings.

J. Verify all piping regulations and regulators required with local gas company before running gas lines.

K. All gas piping that is run exposed to weather shall be given two coats of rust resisting paint.

L. All gas piping in trenches, tunnels and concealed above inaccessible ceilings shall be welded construction.

M. All gas piping carrying 1 psig or more shall be welded.

N. Install horizontal press pipe fittings with pipe supports no further than 2 feet from either end of fitting to prevent pipe sag that could affect integrity of fitting connection.

O. Install rigid gas piping free of sags or bends.

3.02 GAS REVISIONS

A. The present natural gas service shall remain in its' present location. This contractor shall connect to the present gas manifold and shall re-work manifold as required.

B. Provide new natural gas service. Coordinate equipment and installation requirements with local utility company. Verify requirements prior to bid.

C. Any charges by the gas utility company to provide service to the building shall be included in this contractor's bid.

D. The gas line shall run and be connected to all the new natural gas loads to include new AHU's, new water heaters and new kitchen.

E. The present natural gas service to the existing building shall be disconnected and removed to the meter.

F. Gas mains run over roof shall be supported on 4' x 4' sleepers, roof products, corps supports, or plastic molded roof support devices.

G. Coordinate construction heating gas requirements with utility company prior to start of construction.

END OF SECTION 23 11 23

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping

B. Refrigerant

C. Flexible connections

1.02 RELATED SECTIONS

A. Specification Section 23 5400 - Furnaces

B. Specification Section 23 6213 - Packaged Air Cooled Refrigerant Compressor and Condensing Units

C. Specification Section 23 6215 - Variable Refrigerant Flow Systems

D. Specification Section 23 6313 - Air Cooled Refrigerant Condensers

E. Specification Section 23 8126 - Ductless Split System Units

F. Specification Section 23 8216 - Air Coils

1.03 REFERENCES

A. ASHRAE 15 - Safety Code for Mechanical Refrigeration

B. ASHRAE 34 - Number Designation of Refrigerants

C. ASME - Boiler and Pressure Vessel Codes, Section IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

E. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes

F. ASME B31.5 - Refrigeration Piping

G. ASME B31.9 - Building Services Piping

H. ASME SEC 8D - Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels

I. ASTM B1003 - Standard Specification for Seamless Copper Tube for Linesets

J. ASTM B88 - Seamless Copper Water Tube

K. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

L. ASTM F708 - Design and Installation of Rigid Pipe Hangers

M. AWS A5.8 - Brazing Filler Metal

N. AWS D1.1 - Structural Welding Code, Steel

O. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer

P. MSS SP69 - Pipe Hangers and Supports - Selection and Application

Q. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 SYSTEM DESCRIPTION

A. Flexible Connectors: Utilize at or near compressors where indicated on plans.

1.05 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
      b. Product Data: Provide general assembly of specialties, including manufacturers catalog information. Provide manufacturers catalog data including load capacity.
      c. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
      d. Installation Instructions

C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Operation and Maintenance Information

D. Project Record Documents
   1. Indicate final installed locations of all equipment and refrigeration accessories on a PDF floor plan

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this section with minimum three years experience.

B. Design piping system under direct supervision of a professional engineer experienced in design of this work and licensed in Iowa.

C. All welders shall be certified under ASME Section IX.

1.07 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME Section IX and applicable state labor regulations.

C. Welder's Certification: In accordance with ASME Section IX.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Architectural Specification.

B. Deliver and store piping in shipping containers with labeling in place.

C. Protect piping from entry of contaminating material by leaving end caps and plugs in place until installation.

D. Dehydrate and charge piping. Seal prior to shipment, and until connected into system.

1.09 MAINTENANCE MATERIALS

A. Provide two refrigeration oil test kits each containing everything required to conduct one test.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tubing (all sizes) ASTM B280, type #ACR hard drawn
   1. Fittings: ASME B16.50 wrought copper alloy
   2. Joints: Brazed, ANSI/AWS A5.8 filler metal

B. Copper Tubing (7/8" and smaller): ASTM B280, type #ACR annealed
   1. Fittings: ASME B16.26 cast copper alloy
   2. Joints: Flared

C. Flexible Line Sets:
   1. Tubing: ASTM B280 or B1003 copper tubing

2. Joints: Flared
3. Insulation:
    a. Type: Closed Cell Elastomeric (Polyethylene Foam is not acceptable), Insulation must be factory applied. Field installation is not acceptable.
    b. Thickness: 1/2" on Suction and Liquid Lines (R 3.0). Provide 1" insulation on tubing 1" and larger.
    c. Standards: ASTM C534 (moisture resistance) and UL-94 or ASTM E84 compliant (smoke/flame spread)
    d. Jacket: Abrasion and UV resistant coating (5 year warranty). ASTM E96 for permeability

2.02 REFRIGERANT

A. See individual equipment specification or schedule on drawings.

2.03 FLEXIBLE CONNECTORS

A. Manufacturers:
    1. Parker
    2. Alco
    3. Engineer approved equal

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum nine inches (9") long with copper tube ends; for maximum working pressure 500 psig.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Route piping in orderly manner with plumbing parallel to building structure and maintain gradient.

B. Install piping to conserve building space and not interfere with use of space.

C. Group piping whenever practical at common elevations and locations.

D. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

E. Arrange piping to return oil to compressor. Provide traps and loops in piping and provide double risers as required. Slope piping per manufacturer's recommendations. Pipe size to be provided by unit manufacturer.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access to concealed fittings. Coordinate size and location of access doors.

H. Flood piping system with nitrogen when brazing.

I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.

K. Insulate piping and equipment.

L. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

M. Tighten flared fittings to manufacturer-required torque levels.

N. Fully charge completed system with refrigerant after testing.

O. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide

necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

P. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under provisions of Architectural Specification Sections.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to the operating pressure of the system. Hold pressure and ensure no leaks for 1 hour. Ensure test conforms to current code and manufacturer requirements.

D. Vacuum test system at 500 microns vacuum. System shall maintain a vacuum of no more than 1,500 microns after 10 minutes.

END OF SECTION 23 23 00

SECTION 23 31 00
HVAC DUCTS AND CASING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials

B. Ductwork fabrication

C. Manufactured ductwork and fittings

D. Exposed spiral ductwork

1.02 RELATED SECTIONS

A. Specification Section 23 0593 - Testing, Adjusting, and Balancing for HVAC

B. Specification Section 23 0713 - Duct Insulation.

C. Specification Section 23 3300 - Air Duct Accessories.

D. Specification Section 23 3700 - Air Outlets and Inlets.

1.03 REFERENCES

A. ASTM A 36 - Structural Steel

B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

C. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

D. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality

E. ASTM A 480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

F. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

G. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality

H. ASTM A 568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled

I. ASTM A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality

J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate

K. AWS D9.1 - Welding of Sheet Metal

L. NBS PS 15 - Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment

M. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

N. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems

O. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying

P. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment

Q. SMACNA - HVAC Air Duct Leakage Test Manual

R. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

S. UL 181 - Factory-Made Air Ducts and Connectors

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data
      b. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration for four inch (4") pressure class and higher and kitchen hood exhaust systems.

C. Project Record Documents
   1. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

B. Maintain one copy of document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three-years experience.

B. Installer: Company specializing in performing the work of this section with minimum three-years experience.

1.08 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A Standards.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Ducts: ASTM A924 and ASTM A653 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.

B. Insulated Flexible Duct
   1. Manufacturers:
      a. Thermaflex G-KM
      b. Flexmaster
      c. Atco
      d. Engineer approved equal.
   2. UL 181, Class 1, NFPA 90A and 90B compliant, interlocking spiral of steal wire, fiberglass insulation with R value of 4.2 or greater; core shall be chlorinated polyethylene vapor barrier film. (Polyester is not acceptable). Outer shell/vapor barrier shall be metalized polyester or polyethylene film.
   3. Pressure Rating: Six inch (6") positive and one inch (1") negative.
   4. Maximum Velocity: 5000 fpm.
   5. Temperature Range: -20 to 180 deg F.

6. Vapor Transmission: 0.1 perms or less (ASTM E96)
7. Flex Elbows: Flex duct 90 degree elbow splines for connections to diffusers. Flex elbows shall prevent kinks in flex duct. Elbow spline shall be UL-2043 listed for use in plenums.

C. Fasteners: Rivets, bolts or sheet metal screws.

D. Duct Sealant
1. Manufacturers:
   a. Design Polymerics (DP1010)
   b. Ductmate
   c. Durodyne
   d. Hardcast
   e. Engineer approved equal.
2. Description: Water based, non hardening, high velocity/high pressure duct sealant intended for indoor and outdoor HVAC ducts.
3. Pressure Rating: 10" water column minimum.
4. Service Temperature: -20 to 200F
5. Listings
   a. ASTM E-84/UL723 Flame/Smoke Spread: 25/50 or less.
   b. UL-181B listed for use on Flex Duct connections.
   c. Conforms to NFPA 90A & 90B requirements.
   d. Approved for use on interior of ducts.
6. VOC Content
   a. 250 g/l or less (SCAQMD Rule 1168 limitations)
   b. CDPH Standard Method v1.1 (14 days): Less than 5.0 mg/m3.

E. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end.

2.02 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing and sealing for operating pressures indicated.

B. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible; maximum 30 degree divergence upstream of equipment and 45 degree convergence downstream.

C. Construct T'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 are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with fiberglass insulation.

D. Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum four inch (4") cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs or 90 degree conical tee takeoffs.

F. Fabricate all exposed ductwork using paint grip galvanized sheet metal.

G. All outside air intake or relief ductwork above finished areas shall be caulked to be watertight. An auxiliary continuous drain pan shall be provided beneath these ducts to prevent damage in case of a waterproofing failure. Line this drain pan with 1/2 inch duct liner and turn up all edges.

H. All joints in rectangular, round or oval ductwork that exceed 100 inches in perimeter length shall be made with Ductmate, TDC, or TDF connections.

2.03 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Round Ducts: Machine made from round spiral lock seam duct with light reinforcing corrugations, fittings manufactured at least two gauges heavier metal than duct.

2.04 EXPOSED SPIRAL DUCTWORK

A. Galvanized spiral duct construction and gauge shall be in accordance with SMACNA HVAC Duct Construction Standards.

B. Fittings: All fittings shall be self-sealing, double lipped, gasket type fittings with EPDM rubber gasket. No external sealant or tape is allowed. Fittings shall be galvanized steel constructed in accordance with ASTM A653 and A924.

C. Elbows: Elbows shall be gored elbows. 45° elbows shall be 3-piece elbows and 90° elbows shall be 5-piece elbows.

D. Hangers: Exposed spiral duct hangers shall be steel aircraft quality zinc coated wire hangers or 1/8" thick, 1" wide galvanized steel strap with threaded rod.

E. Taps: System shall utilize high efficiency shoe type saddle taps.

F. Reducers: All spiral reducers in exposed areas shall be concentric to keep centerline of duct at consistent elevation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. All ductwork shall be sealed to provide a SMACNA Seal Class A installation for all longitudinal seams, all transverse seams and all duct penetrations. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested in compliance with ASTM-E-84-87.

D. Sealant shall be non-hardening and water resistant. Sealant shall be capable of being applied with a brush and shall be applied in accordance with manufacturer's instructions. Each seam or penetration shall be dressed after application of sealant for neat appearance.

E. Ductwork shall be installed following lines indicated on the drawings. Install offsets, and angles. Transitions may be required to avoid interference with other work and existing conditions. Maintain full capacity of ductwork.

F. Flex Duct Installation:
   1. Maximum length of flex duct: 5ft
   2. Provide 90 deg elbow splines to prevent flex duct kinking, especially when connecting to ceiling diffusers
   3. Connections to rigid ducts and fittings: Peel back insulation and place flexible inner core over fitting and seal with two layers of duct tape (minimum 2" overlap on fitting and flex duct core). Install clamps over the top of the duct tape. Stretch insulation back over fitting and wrap with two layers of duct tape. Duct Sealant/Mastic may be substituted for the tape that seals the inner core to the fitting. Refer to manufacturer's instructions. Duct tape, mastic/sealant and clamps shall be UL181 listed.

G. Dust Collection System Installation:
   1. Install in accordance with [NFPA 91], SMACNA [HVAC Duct Construction Standards - Metal and Flexible two inch (2") pressure class] [Round Industrial Duct Construction Standard and Rectangular Industrial Duct Construction Standard], and ACGIH Industrial Ventilation Manual except as indicated.
   2. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Duct sizes:
   1. Duct sizes listed on plans are sheet metal outside dimensions.
   2. Maintain listed outside dimensions for lined ducts.
   3. Any exterior insulation dimension will be in addition to listed sheet metal dimensions.

4. See drawings for specifics on double wall duct dimensions.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

K. Use crimp joints with or without bead for joining round duct sizes eight inch (8") and smaller with crimp in direction of airflow.

L. Use double nuts and lock washers on threaded rod supports.

M. Connect terminal units to supply ducts directly with rigid duct. Do not use flexible duct.

N. Connect diffusers to low pressure ducts directly or with five foot (5') maximum length of flexible duct held in place with strap or clamp.

O. Connect flexible ducts to metal ducts with draw bands.

P. Set plenum doors between 6 and 12 inches above floor. Arrange door swing so that fan static pressure holds door in closed position.

Q. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

R. For units with filtered return air grilles (fan coils, blower coils, heat pumps, etc.), remove the unit filter and connect the return air ductwork tight to the unit. The return duct shall match the size of the unit return air opening.

3.02 SCHEDULES

DUCTWORK MATERIAL

AIR SYSTEM	MATERIAL
Supply	Galvanized Steel
Return and Relief	Galvanized Steel
General Exhaust	Galvanized Steel
Outside Air Intake	Galvanized Steel
Combustion Air	Galvanized Steel

DUCTWORK PRESSURE CLASS

AIR SYSTEM	PRESSURE CLASS
Supply	2"
Return and Relief	1"
General Exhaust	1"
Intake and Exhaust	1"
Outside Air Intake	1/2"

DUCT PRESSURE CLASS (IN.)	SYSTEM FAN EXTERNAL STATIC PRESSURE
1/2" w.g.	Up to1/2” w.g.
1” w.g.	Over 1/2” up to 1 w.g.
2” w.g.	Over 1” up to 2” w.g.
3” w.g.	Over 2” up to 3” w.g.
4” w.g.	Over 3” up to 4” w.g.
6” w.g.	Over 4” up to 6” w.g.
10” w.g.	Over 6” up to 10” w.g.

END OF SECTION 23 31 00

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers
B. Combination fire/smoke dampers
C. Duct access doors
D. Duct test holes
E. Fire dampers
F. Flexible duct connections
G. Rectangular Manual Balance Dampers
H. Round Manual Balance Dampers
I. Iris Manual Balance Dampers with flow measurement
J. Pressure Independent Automatic Balancing Dampers
K. Rectangular control dampers

1.02 RELATED SECTIONS

A. Specification Section 23 0548 – Vibration and Seismic Controls for HVAC Piping and Equipment
B. Specification Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCES

A. AMCA 500-D – Laboratory Methods of Testing Dampers
B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
C. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
D. NFPA 92A - Smoke Control Systems
E. NFPA 70 - National Electrical Code
F. SMACNA - HVAC Duct Construction Standards - Metal and Flexible
G. UL 33 - Heat Responsive Links for Fire-Protection Service
H. UL 555 - Fire Dampers and Ceiling Dampers
I. UL 555S - Leakage Rated Dampers for use in Smoke Control Systems

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data, including electrical characteristics if applicable
        b. Shop Drawings
        c. Installation Instructions
C. Project Record Documents
    1. Indicate final installed locations of all components on a PDF floor plan, including remote test switches for life safety dampers

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. 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. Deliver, store, protect and handle products to site under provisions of Architectural Specification Sections.

B. Protect dampers from damage to operating linkages and blades.

1.08 EXTRA MATERIALS

A. Provide two of each size and type of fusible link for each style or type of fire damper or combination fire/smoke damper furnished for this project.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS

A. Backdraft Dampers (Standard)
   1. Manufacturers:
      a. Ruskin BD6
      b. Greenheck
      c. United Enertech
      d. Air Balance
      e. Pottorff
      f. Engineer approved equal.
   2. Construction:
      a. Frame: Extruded aluminum, 0.07” thick, 2" deep assembly
      b. Blades: Extruded aluminum, 0.05" thickness with neoprene or vinyl seals, mechanically attached (no adhesive).
      c. Bearings: Nylon
      d. Axles: 1/2" extruded aluminum
      e. Linkage: Located in airstream
   3. Orientation: Horizontal or "airflow up"
   4. Performance:
      a. Max velocity: 2500 fpm at 24”
      b. Leakage: 8.7 cfm/ft2 @ 1” w.g. (24”x24”)
   5. Mounting: See plans

2.02 COMBINATION FIRE/SMOKE DAMPERS

A. Manufacturers:
   1. Ruskin
   2. Greenheck
   3. United Enertech
   4. Nailor
   5. Air Balance
   6. NCA
   7. Pottorff
   8. Engineer approved equal.

B. Fabricate in accordance with NFPA 90A, UL 555S (latest edition) and as indicated.

C. Provide factory sleeve and collar for each damper.

D. Ratings (refer to code review plans for wall classifications):
   1. Fire: 1-1/2 hours or 3 hours in accordance with UL555.

2. Smoke: Leakage class II and in accordance with UL 555S.
3. Temperature: 350F
4. Air velocity: 2000 fpm
5. Differential Pressure: 4” WC

E. Multiple Blade Dampers (Vertical & Horizontal):
1. Minimum 16 gauge galvanized steel frame and 6 inch (6”) maximum width 3-V shape roll formed galvanized steel blades.
2. Oil-impregnated bronze or stainless steel sleeve bearings and plated steel axels.
3. Silicone rubber blade seals permanently bonded to the blade.
4. Stainless steel jamb seals.
5. 1/8" x 1/2" plated steel concealed linkage.
6. Factory installed sleeve. Provide extended length sleeves where required.
7. Stainless steel closure spring, blade stops and lock.
8. 1/2 inch actuator shaft.
9. Fire closure device: Electric thermostat type with externally mounted electric actuator, closure temperature at 212 deg F.

F. Operators:
1. UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz.
2. Locate damper operator on exterior of duct and link to damper operating shaft.
3. Operator shall have open/close labeling to indicate damper position. Provide factory identification to determine damper position. [MERCY DUBUQUE ONLY: Damper operators shall be Honeywell only]

G. All damper motors shall be quiet operating. Stall type motors shall not be allowed.

H. Accessories:
1. Factory installed duct smoke detector in the damper sleeve with factory installed wiring from the actuator to the smoke detector. Option provides a single point power connection.
2. Field installed duct smoke detector and wiring by fire alarm contractor. Detector shall be installed within the nearby ductwork in accessible location with field installed wiring between the actuator and detector.
3. Provide manufacturer's toggle-style test switch.

2.03 DUCT ACCESS DOORS

A. Manufacturers:
1. Ruskin
2. Nailor
3. Ductmate
4. Acudor
5. Engineer approved equal.

B. Frame: 22 gauge galvanized steel

C. Door: 22 gauge double skin galvanized

D. Seal: Neoprene

E. Insulation: 1” Fiberglass (on insulated duct only)

F. Configuration:
1. Less Than 12 Inch Square: Secure with two (2) Cam locks.
2. Up to 24 inch Square: Continuous plated steel hinge and two Cam locks.
3. Walk Through Access Doors (Plenum Door): Continuous plated steel hinge with two
a. dual acting handles.
4. Spiral Duct Doors: Dual plate covers with large hand tightening knobs.

G. Access doors with sheet metal screw fasteners are not acceptable.

H. Windows: Provide where noted on plans

2.04 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches or neoprene plugs.

B. Permanent Test Holes: Factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FIRE DAMPERS

A. Manufacturers:
   1. Ruskin
   2. Greenheck
   3. United Enertech
   4. Nailor
   5. Air Balance
   6. NCA
   7. Pottorff
   8. Engineer approved equal.

B. Fabricate in accordance with NFPA 90A and UL 555 (latest edition) and as indicated.

C. Ratings (refer to code review plans for wall classifications):
   1. 1-1/2 hours in accordance with UL-555
   2. 3 hours in accordance with UL-555
   3. Air Velocity: 3000 fpm
   4. Differential Pressure: 4” WC

D. Multiple Blade Dampers (Vertical & Horizontal):
   1. Minimum 16 gauge galvanized steel frame and 6 inch (6”) maximum width 3-V shape roll formed galvanized steel blades.
   2. Oil-impregnated bronze or stainless steel sleeve bearings and plated steel axels.
   3. 1/8" x 1/2" plated steel concealed linkage.
   4. Stainless steel closure spring, blade stops and lock.
   5. Locate damper operator on exterior of duct and link to damper operating shaft. Operator shall have open/close labeling to indicate damper position. Provide factory identification to determine damper position.
   6. Factory installed sleeve. Provide extended length sleeves where required
   7. Provide with round duct transitions where required.
   8. Fusible Link: UL 33, separate at 212 deg F with adjustable link straps for combination fire/balancing dampers.

2.06 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers
   1. Ductmate ProFlex
   2. DuroDyne
   3. DynAir/Carlisle
   4. Engineer Approved Equal

B. Description: Flexible duct connections to isolate vibration from HVAC equipment

C. Materials:
   1. Duct Connections: 24 gauge galvanized sheet metal
   2. Fabric Type: Fiberglass core with Neoprene coating. Provide a Hypalon coating (UV resistant) on exterior duct connections.

D. Size:
   1. Metal: 3” (both ends)
   2. Fabric: 3”. Provide 6” fabric on connections with circumferences greater than 100”

E. Service Temp: -35F to 200F

F. Surface Burning characteristics: Meets ASTM-E84 and NFPA 701

2.07 RECTANGULAR MANUAL BALANCE DAMPERS

A. Size and Application:
   1. 18” wide x 12” tall and smaller: Field/Shop Fabricated or Factory Provided.
   2. Larger than 18” wide x 12” tall: Factory Provided.

B. Field/Shop Fabricated Rectangular Balance Dampers
   1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, current addition and per the below:
      a. Blade: 24 Gage minimum, but not thinner than two gages thinner than duct gage. Blade must have hemmed edges and be 1/8” smaller than the duct on all sides.
      b. Rod: 3/8” minimum. Rod shall be continuous on 2” pressure class and above.
      c. Bearings: Provide closed end bearings for rod penetrations
      d. Locking Device: Provide quadrant locking device to keep damper in fixed position.
   2. Stand-off plate: On insulated ducts, provide a 2” stand-off plate to allow for damper operation after insulation installation.
   3. Sealing: Damper component penetration of ducts must be sealed to maintain a Class A Seal rating.

C. Factory Fabricated Manual Balance Dampers
   1. Manufacturers
      a. Greenheck MBD
      b. Ruskin
      c. Pottorff
      d. United Enertech
      e. Engineer approved equal
   2. Description: Rectangular damper intended for balancing purposes (not for positive shut-off or control)
   3. Construction:
      a. Frame: Galvanized, 16 gauge
      b. Blades: Galvanized, 16 gauge, Opposed blade orientation, 20 gauge blade stops
      c. Control Shaft: Steel, 3/8” diameter (minimum)
      d. Bearings: Synthetic Nylon
      e. Linkage: Concealed in frame
      f. Stand-off Plate: 2” stand-off plate to allow for damper operation after insulation installation.
      g. Operator: Locking Hand Quadrant
   4. Remote Cable Operator (when indicated on the plans):
      a. Cable Operator: Worm gear operator in lieu of lock hand quadrant.
      b. Cable: Steel, with coupling and clips to secure to operator.
      c. Ceiling Cup/Wall Plate: Galvanized steel and fire rated bracket. See plans for type and location.
   5. Performance:
      a. Max Velocity: 1500 fpm
      b. Max Pressure: 2.5” W.C.
      c. Temperature range: -40 to 180 degrees f

2.08 ROUND MANUAL BALANCE DAMPER

A. Field/Shop Fabricated Round Balance Dampers
   1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, current addition and per the below:
      a. Blade: 24 Gage minimum, but not thinner than two gages more thin than duct gage
      b. Rod: 3/8” minimum. Rod shall be continuous on 2” pressure class and above. Rod shall also be continuous on all ducts 12” and larger.
      c. Bearings: Provide closed end cast alloy bearings for rod penetrations
      d. Locking Device: Provide quadrant locking device to keep damper in fixed position.

e. Stand-off plate: Provide a 2” stand-off plate to allow for damper operation after insulation installation.

2. Sealing: Damper component penetration of ducts must be closed and sealed to maintain a Class A system rating.

B. Factory Fabricated Manual Balance Dampers
1. Manufacturers
a. Greenheck MBDR
b. Ruskin
c. Pottorff
d. United Enertech
e. Engineer approved equal
2. Description: Circular damper intended for balancing purposes (not for positive shut-off or control)
3. Construction:
a. Frame: Galvanized, 20 gauge
b. Blade: Galvanized, 20 gauge
c. Shaft: Steel, 3/8” diameter (minimum)
d. Bearings: Synthetic Nylon
e. Stand-off Plate: 2” stand-off plate to allow for damper operation after insulation installation.
f. Operator: Locking Hand Quadrant
4. Remote Cable Operator (when indicated on the plans):
a. Cable Operator: Worm gear operator in lieu of lock hand quadrant
b. Cable: Steel, with coupling and clips to secure to operator.
c. Ceiling Cup/Wall Plate: Galvanized steel and fire rated bracket. See plans for type and location.
5. Performance:
a. Max Velocity: 1500 fpm
b. Max Pressure: 1” W.C.
c. Temperature range: -25 to 180 degrees

2.09 MANUAL BALANCE DAMPER (REMOTE BATTERY OPERATED)

A. Manufacturers:
1. Ruskin [#ZPD15 Square/Rectangular] [#ZPD25 Round]
2. Engineer approved equal.

B. Provide motorized balancing damper where indicated. Damper shall be galvanized steel with motorized actuator. Motor shall be gear drive, fail-in-place with nine-volt DC Power through remote damper controller.

C. Provide a single ZRC 020 nine-volt battery remote damper controller to be used during balancing. Turn over controller to owner after balancing.

D. Provide RJ11 connector for cable termination at diffuser or wall box. Box shall be ceiling or wall mounted. Box shall have a label noting the damper being served. See drawings for required cable length.

E. Damper, cabling, and controller shall be provided by mechanical contractor.

2.10 IRIS MANUAL BALANCE DAMPERS WITH FLOW MEASUREMENT

A. Manufacturers
1. Fantech “IR”
2. Continental Fan
3. United Enertech
4. Young Regulator
5. Engineer Approved equal

B. Description: Circular damper with pressure taps upstream and downstream of the adjustable orifice blades for airflow balancing/measurement.

C. Construction
   1. Blades and Casing: Galvanized Steel
   2. Connector Gasket: EPDM

D. Operation: Factory supplied spanner wrench.

E. Accuracy: +/- 5% when installed in a straight duct per the installation manual.

F. Sizing: Damper size shall be determined by the required airflow, not the line size noted on the plans. Provide necessary transitions to allow for the appropriately sized damper. Adhere the manufacturer's requirements for straight duct distances upstream and downstream of the damper.

2.11 PRESSURE INDEPENDENT AUTOMATIC BALANCING DAMPER (ABD)

A. Manufacturers
   1. Greenheck ABD
   2. Ruskin
   3. Pottorff
   4. Automatic Airflow Balancing
   5. Engineer Approved Equal

B. Description: Airflow balancing damper that automatically adjusts based on available static pressure (pressure independent). Airflow setpoint shall be easily adjustable without the use of special tools.

C. Construction:
   1. Frame: Thermoplastic or ABS resin compliant with UL2043
   2. Seal: Rubber gasket along the perimeter of both ends
   3. Spring: Stainless Steel
   4. Bearings: Oil Filled, hermetically sealed

D. Performance:
   1. Pressure Range: 0.2" to 2.0" water column
   2. Temperature Range: 25-150 degrees F
   3. Accuracy: +/- 10% of setpoint CFM

E. Sizing:
   1. Damper size shall be determined by the required airflow, not the line size noted on the plans. Provide necessary transitions to allow for the appropriately sized damper. Adhere the manufacturer's requirements for straight duct distances upstream and downstream of the damper.

2.12 RECTANGULAR CONTROL DAMPERS

A. Test in accordance with AMCA 500. Damper must be a Class 1 or 1A low leakage damper.

B. Frames must be aluminum or galvanized steel welded or riveted with corner reinforcement, minimum 16 gauge.

C. Blades must be aluminum or galvanized steel airfoil shape with maximum blade size of 6" W x 48" L minimum 22 gauge, attached to minimum 1/2 inch shafts with setscrews.

D. The maximum section size must not be larger than 48" W x 48" H. A larger damper must be constructed of multiple sections joined together by a jack shaft.

E. All single section dampers must have an extended shaft.

F. Blade seals must be synthetic elastomeric mechanically attached, field replaceable.

G. Shaft bearings must be plastic or stainless steel.

H. Jamb seals must be compressible and flexible metal.

I. The leakage must be 4 CFM/SF or less at one inch (1") wg static pressure difference.

J. The fully closed damper assembly must be capable of withstanding the shutoff pressure (total pressure of fan produced at no flow) of the air moving system's fan without damage.

K. The damper must have an operating temperature range of -40 to 200 deg F.

L. Operators:
   1. Provide smooth proportional control with sufficient power for air velocities 20% greater than maximum design velocity and provide tight seal against maximum system pressures. Provide spring return for two-position dampers and for modulating dampers requiring fail-safe operation.
   2. All modulating damper actuators must be electronic, using a 120V positioning input.
   3. Modulating outside, relief and exhaust air dampers, modulating return air dampers associated with an outside air damper and modulating face and bypass dampers associated with a heating coil must fail safe. The outside, relief and exhaust dampers must fail closed. The return dampers must fail open. The face and bypass dampers must fail to an open face and a closed bypass.
   4. All two-position damper actuators must be electronic, using a 120v positioning input.
   5. Provide a sufficient number of damper actuators, each of sufficient torque, to achieve smooth movement throughout the damper assembly range. As a minimum, provide one damper operator for every 16 sq. ft. of damper area.

2.13 ROUND CONTROL DAMPERS

A. Test in accordance with AMCA 500.

B. Damper must be butterfly type with circular blade attached to a shaft.

C. Frames must be aluminum or galvanized steel, minimum 20 gauge.

D. Blades must be aluminum or galvanized steel, minimum 22 gauge, attached to 1/2 inch shaft.

E. The damper must have an extended shaft.

F. Blade seals must be synthetic elastomeric mechanically attached.

G. Shaft bearings must be plastic or stainless steel.

H. The leakage must be 0.1 CFM/perimeter inch or less at one inch (1") wg static pressure difference.

I. The fully closed damper assembly must be capable of withstanding the shutoff pressure (total pressure of fan produced at no flow) of the air moving system's fan without damage.

J. The damper must have an operating temperature range of -40 to 200 deg F.

K. Operators:
   1. Provide smooth proportional control with sufficient power for air velocities 20% greater than maximum design velocity and provide tight seal against maximum system pressures. Provide spring return for two-position dampers and for modulating dampers requiring fail-safe operation.
   2. All modulating damper actuators must be electronic, using a 0-10 Vdc or 4-20 mA positioning input.
   3. Modulating outside, relief and exhaust air dampers, modulating return air dampers associated with an outside air damper and modulating face and bypass dampers associated with a heating coil must fail safe. The outside, relief and exhaust dampers must fail closed. The return dampers must fail open. The face and bypass dampers must fail to an open face and a closed bypass.
   4. All two-position damper actuators must be electronic, using a 120v positioning input.
   5. Provide a sufficient number of damper actuators, each of sufficient torque, to achieve smooth movement throughout the damper assembly range.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install duct pressure relief doors in [ductwork serving] [unit casing of] the scheduled equipment.

B. Install duct pressure relief doors in easily observable location.

C. Adjust duct pressure relief doors to the specified pressure relief setting.

D. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.

E. Provide backdraft dampers on exhaust ducts nearest to outside and where indicated.

F. 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. Review locations prior to fabrication.

G. Provide duct test holes where indicated and required for testing and balancing purposes.

H. Provide fire dampers, combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, and breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

I. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.

J. Demonstrate re-setting of fire dampers to owner's representative.

K. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators.

L. Provide volume balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off. Drawings may not indicate all volume damper locations.

M. Provide volume 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. Locate as close as possible yet accessible to the main trunk duct. Drawings may not indicate all volume damper locations.

N. The electrical contractor shall wire smoke damper operators.

O. Provide turning vanes in all supply, return and exhaust ductwork unless noted otherwise. Turning vanes shall not be installed in kitchen hood exhaust, dishwasher hood exhaust and kiln hood exhaust.

P. Provide original installation inspection during construction and 11-month re-inspection after substantial completion of all existing and new fire/smoke/fire smoke dampers in all HVAC systems serving project's construction area. Mechanical Contractor shall adjust, fix or replace any damper found not to meet installation requirements. Provide an electronic log of all dampers with size, location, pre-inspection condition and post-inspection condition to Owner and Design Team after original inspection and after re-inspection of fire/smoke/fire smoke dampers.

END OF SECTION 23 33 00

SECTION 23 34 17
HIGH VOLUME, LOW SPEED FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Destratification fans

1.02 RELATED SECTIONS

A. Specification Section 21 1300 Fire Suppression Sprinkler Systems

B. Specification Section 23 0000 Heating, Ventilating, and Air Conditioning (HVAC)

C. Specification Section 26 0000 Electrical

1.03 REFERENCES

A. National Fire Protection Agency (NFPA)

B. Underwriters Laboratory (UL)

C. Restriction of Hazardous Substances (ROHS)

D. International Organization for Standardization (ISO)

E. National Electrical Manufacturers Association (NEMA).

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

G. NEMA MG1 - Motors and Generators.

H. NFPA 70 - National Electrical Code.

I. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data indicating fan power, fan RPM, sound power levels, electrical characteristics, connection requirements, mounting recommendations and controller information.
      b. Shop Drawings indicating product dimensions, weight, and attachment methods.

C. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Warranty documentation, fully filled out and including start-up and start date information.
      b. Operation and Maintenance Information

1.05 QUALITY ASSURANCE

A. Certifications
   1. The fan assembly, as a system, shall be ETL-certified and built pursuant to the guidelines set forth by UL standard 507 and CSA standard 22.2 No. 113-08.
   2. The fan shall be compliant with NFPA 13-Standard for the Installation of Sprinkler Systems, NFPA 72-National Fire Alarm and Signaling Code, and NFPA 70-2011- National Electric Code (NEC).

3. Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratory (UL) standards and shall be labeled where required by code.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.

B. The fan and its components must be stored in a safe, dry location until installation.

1.07 WARRANTY

A. Airfoils Lifetime (Parts)

B. Hub Lifetime (Parts)

C. Motor 15 years (Parts)

D. Gearbox 15 years (Parts)

E. Controller 15 years (Parts)

F. All other fan components 15 years (Parts)

G. Labor 1 year

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Big Ass Fans

B. MacroAir

C. Skyblade

D. Engineer approved equal.

2.02 HIGH VOLUME, LOW SPEED FANS

A. Complete Unit
   1. Regulatory Requirements: The entire fan assembly shall be ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.
   2. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.

B. Onboard Fan Control
   1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation.

C. Airfoil System
   1. The fan shall be equipped with airfoils of extruded aluminum alloy.

D. Motor
   1. The fan motor shall be an AC induction type inverter rated. Mounting Post
   2. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

E. Mounting System
   1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of welded construction and made from low carbon A36 steel no less than 3/16” thick, per ASTM A36, and be powder coated for appearance and resistance to corrosion.
   2. All mounting bolts shall be SAE Grade 8 or equivalent.

F. Hub
   1. The fan hub shall be made of cut aluminum for high strength and light weight.

G. Safety Cable
   1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be Ø3/8" diameter and fabricated out of 7 x 19 zinc galvanized steel cable.
   2. Field construction of safety cables is not permitted.

H. Control
   1. The fan is equipped with a wall control providing 100% control of all fan functions. The wall control shall be a digital keypad device mounted. The cover shall be capable of mounting to a standard switch box.
   2. Equipped with touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming.
   3. Equipped with a simple diagnostic program to identify faults in the system. Provisions shall be made for retrieving fan operation and diagnostic data (fault messages) through the remote wall control.
   4. Fans shall have automatic control with temperature sensor at ceiling level and occupied space level to automatically adjust fan speed in both summer and winter mode.

I. Fire Control Panel Integration
   1. Includes a 10-30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

J. Guy Wires
   1. Included for installations with extension tubes 4 ft or longer to limit the potential for lateral movement.

PART 3 EXECUTION

3.01 PREPARATION

A. Fan location must have a bar joist or I-beam structure from which to mount the fan. Additional mounting options may be available.

B. Mounting structure must be able to support weight and operational torque of fan.

C. Fan location must be free from obstacles such as lights, cables, or other building components.

D. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.

E. Each fan requires dedicated branch circuit protection.

3.02 INSTALLATION

A. Install the fan according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle iron for bar joist applications.

B. Minimum Distances
   1. Airfoils must be at least 10 ft above the floor.
   2. 3.2 Installation area must be free of obstructions such as lights, cables, sprinklers or other building structures with the airfoils at least 2 ft clear of all obstructions.
   3. The structure the fan is attached to shall be capable of supporting a torque load of up to 300 ft?lb of torque

C. The fan shall not be located where it will be continuously subjected to wind gusts or near the outputs of HVAC systems or radiant heaters.

D. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all the following:
   1. The maximum fan diameter shall be 24 ft.
   2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
   3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft.

4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72 - National Fire Alarm and Signaling Code.

END OF SECTION 23 34 17

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters
B. Wall exhausters
C. Cabinet and ceiling exhaust fans
D. Vehicle exhaust system

1.02 RELATED SECTIONS

A. Specification Section 23 31 00 - HVAC Ducts and Casings
B. Specification Section 23 33 00 - Air Duct Accessories
C. Specification Section 23 0993 - Sequence of Operation for HVAC Controls

1.03 REFERENCES

A. AMCA 99 - Standards Handbook
B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
C. AMCA 261 - Directory of Products Licensed to Bear the AMCA Certified Ratings Seal
D. AMCA 300 - Test Code for Sound Rating Air Moving Devices
E. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices
F. NEMA MG1 - Motors and Generators
G. UL 705 - Power Ventilators

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data indicating fan power, fan RPM, sound power levels, electrical characteristics, connection requirements, mounting recommendations and controller information.
        b. Shop Drawings indicating product dimensions, weight, and attachment methods.
C. Closeout submittal
    1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Warranty documentation, fully filled out and including start-up and start date information.
        b. Operation and Maintenance Information

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 ROOF EXHAUSTERS

A. Manufacturers:
   1. Greenheck
   2. Carnes
   3. PennBarry
   4. Cook
   5. Twin City Fan
   6. Acme
   7. Engineer approved equal.

B. Product Requirements:
   1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

C. Performance: See drawings.

D. Fan Unit: V-belt or direct driven as indicated with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 16 gauge aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

E. Roof Curb: Self-flashing (14 inch high) aluminum or galvanized steel in here noted with continuously welded seams, built-in cant strips, one inch (1") insulation and curb bottom, curb bottom and factory installed nailer strip. The roof curb is to be approved by the building supplier when used on a metal roof.

F. Disconnect switch:
   1. For thermal overload protected single phase motors or thermal overload protected 3-phase motors under 1 HP: Factory wired NEMA-1 non-fusible disconnect located within fan housing.
   2. For 3-phase motors above 1 HP or any motor without thermal overload protection: Factory provided NEMA-3 non-fusible disconnect to be [factory wired and mounted to the fan casing] OR [field mounted near fan and wired by electrical contractor.]

G. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked. Where indicated on the drawings and schedules provide a powered back draft damper with line voltage motor drive, power open, and spring return. Verify voltage.

H. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

I. Provide wall mounted solid state speed controller where indicated.

2.02 WALL EXHAUSTERS

A. Manufacturers:
   1. Greenheck
   2. Cook
   3. Carnes
   4. PennBarry
   5. Engineer approved equal.

B. Performance: See drawings.

C. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor, 1/2 inch mesh, 16 gauge aluminum wire bird screen.

D. Disconnect Switch:
   1. For thermal overload protected single phase motors or thermal overload protected 3-phase motors under 1 HP: Factory wired NEMA-1 non-fusible disconnect located within fan housing.
   2. For 3-phase motors above 1 HP or any motor without thermal overload protection: Factory provided NEMA-3 non-fusible disconnect to be [factory wired and mounted to the fan casing] OR [field mounted near fan and wired by electrical contractor.]

E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

F. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked. Where indicated on the drawings and schedules provide a powered back draft damper with line voltage motor drive, power open, and spring return. Verify voltage.

G. Sheaves: Provide [cast iron] [steel] (for V-belt drives) dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

H. Provide wall mounted solid state speed controller where indicated.

2.03 CABINET AND CEILING EXHAUST FANS

A. Manufacturers:
   1. Greenheck
   2. Cook
   3. Carnes
   4. PennBarry
   5. Twin City Fan
   6. Acme
   7. Loren Cook
   8. Engineer approved equal.

B. Performance: See drawings.

C. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes and materials indicated.

E. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.

F. Grille: Molded white plastic or aluminum with baked white enamel finish.

G. Sheaves: Steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

H. Provide wall mounted solid state speed controller where indicated.

2.04 VEHICLE EXHAUST SYSTEM

A. Practice Bay:
   1. Manufacturers:
      a. Monoxivent
      b. Carmon
      c. Engineer approved equal.

B. Tubing Storage Reel:
   1. Automatic spring hose reel, Monoxivent Series 9000 or equal.

a. The hose reel shall consist of the following features: The hose reel side plate mounting support frame shall be constructed of 11 gauge cold rolled steel. The side plates shall be drawn securely together and retained by heavy gauge “J” channel steel support braces. These support braces keep the side plates square and solid. The hose reel drum shall be constructed of 16 gauge cold rolled steel. The drum shall be formed and rolled to an 18 inch diameter and strengthened by four inner support bars. These bars are secured to the drum end flanges and pull the drum tightly against the end flange. The drum end flanges shall be constructed of 16 gauge cold rolled steel. The end flange outer edge shall be rolled to provide strength and rigidity. Each end flange shall have a center pressed 18 inch diameter groove. This groove allows the reel drum and end flange to mate so the drum’s inner support bars draw the end flange securely to the drum.
b. The hose reel function shall consist of a spring cassette housing containing a high carbon drive spring. The activation of the manual extension and spring return is by a lock and latch feature.
c. Attach reel to structure using angle iron. Mount rigidly.

C. Flexible Exhaust Hose:
1. Vehicle exhaust extraction hose, Monoxivent Series 4000 or equal. Series 4000 is a double ply hose with an inner liner ply of woven fiberglass coated silicone rubber. A helically wound spring steel wire is imbedded between the inner liner ply and an exterior ply of woven Nomex coated with silicone rubber. The assembly is double wound with a treated Nomex cord and heat vulcanized to provide a greater strength and serviceability. Exhaust hose has a Military Spec: MIL H 62028, Paragraph 4.7.8, 72 hours at 1000 deg F. and a Baking Test rating of 600 deg F.
2. Exhaust Hose shall be 25 foot in length and six inches (6") in diameter.
3. Tail Pipe Adapter:
   a. Stainless Steel Tapered Cone Adapter with Spring Clamp and Lifting Sleeve/Lifting Pole for use on either under chassis or vertical stack exhaust configurations. Monoxivent #TCA-6-SC-LS or equal.
4. Tail Pipe Adapter:
   a. Stainless Steel Tapered Cone Adapter with Spring Clamp and Lifting Sleeve/Lifting Pole for use on either under chassis or vertical stack exhaust configurations. Monoxivent #TCA-6-SC-LS or equal.
5. Direct Mount Blower to Hose Reel:
   a. Pressure blower, directly mounted to hose reel is of cast aluminum construction for the housing and wheel. The motor is TEFC and is both UL & CSA approved. Monoxivent #D10-3-DMHR or equal.
      1) 1 HP, 3450 RPM, 600 CFM @ 4 inch SP, Tri-Voltage, single phase
6. Accessories:
   a. Direct mount fan on/off switch. The toggle switch shall be tied to a starter package for the blower that is in use. Toggle switches shall be used to activate a single direct mount blower on the hose reel. Monoxivent model DMS-HR or equal.
      1) Switch specifications – 15 AMP @ 125 VAC
         (a) 10 AMP @ 250 VAC; 3/4 hp @ 250 VAC
      2) Furnish a hose reel hook to pull down the hose when retraced.
7. Central Blower:
   a. Belt Drive Backward Incline Fan, Monoxivent Series BI or equal.
      1) The scroll wrapper shall be a minimum 14-gauge steel and scroll sides shall be a minimum 12-gauge steel.. The entire fan shall have continuously welded seams. Fans bear the AMCA certified ratings real for air performance. Baked polyester powder coating is standard. The wheel is a backward incline non-overloading, standard steel construction. Motor is an ODP, multi-voltage standard, with TEFC optional. Bearings are a heavy duty re-greasable ball type rated for 200,000 hours.
      2) Belt: V-belt with adjustable base and variable pitch motor pulley.

8. Accessories:
    a. Direct mount fan on/off switch. The toggle switch shall be tied to a control box or a starter package for the blower that is in use. Toggle switches can be used to activate a single direct mount blower on the hose reel. Monoxivent model DMS-HR or equal.
        1) Switch Specifications: 15 AMP @ 125 VAC
            (a) 10 AMP @ 250 VAC; 3/4 hp @ 250 VAC

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof or wall exhausters with cadmium plated steel lag screws to roof curb or structure.

C. Extend ducts to roof or wall exhausters into roof curb or structure. Counterflash duct to roof or wall or opening.

D. Hung Cabinet Fans:
    1. Install fans with resilient mountings and flexible electrical leads.
    2. Install flexible connections between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans.

H. Do not operate fans until ductwork is clean, filters are in place, and bearings are lubricated.

I. Support ceiling fans from structure.

J. Provide kitchen hood up blast exhaust fans with grease trap and vented curb. Exhaust fan housing shall be hinged and the motor and belt drive shall be located out of the air stream.

K. If equipment is to be operated prior to building turn over to the owner, the mechanical contractor must install filter media on all return and exhaust grilles. The contractor shall provide documentation that filters have been check on a daily basis.

3.02 EXAMINATION

A. Examine areas to receive fans. Notify the Design Team Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans.

3.03 SCHEDULES

A. See drawings.

END OF SECTION 23 34 23

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers/registers/grilles

B. Louvers

C. Intake/Relief hoods

D. Goosenecks

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters

C. ARI 650 - Air Outlets and Inlets

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

E. SMACNA - HVAC Duct Construction Standard - Metal and Flexible

F. NFPA 70 - National Electrical Code

G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

1.03 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
   4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data: Contractor shall review outlets and inlets as to size, finish, and type of mounting prior to submission. Review ceiling type and style before submitting.
      b. Schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents
   1. Indicate final installed locations of all components on a PDF floor plan

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.01 DIFFUSERS/REGISTERS/GRILLES

A. Manufacturers:
   1. Titus
   2. Carnes
   3. Tuttle & Bailey
   4. Price Ind.

5. Krueger
6. Nailor
7. Engineer approved equal.

B. Refer to schedule on drawings for style, size, and finish.

2.02 LOUVERS

A. Manufacturers:
1. Ruskin
2. American Warming
3. Louvers and Dampers, Inc.
4. Pottorff
5. Greenheck
6. United Enertech
7. Air Balance
8. Engineer approved equal.

B. Type: Drainable blades on 37-1/2 degree slope, heavy channel frame bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake. (See drawings).

C. Fabrication: Extruded aluminum, 0.080 inch thick welded assembly with factory anodized finish. Color to be selected by architect. Architect has authority to select multiple colors.

D. Mounting: Furnish with exterior flat flange for installation. Verify with architect prior to ordering.

E. Interior louvers shall be constructed of 0.125 inch thickness with welded construction.

F. Refer to drawings for louver dimensions.

2.03 INTAKE/RELIEF HOODS

A. Manufacturers
1. Greenheck
2. United Enertech
3. PennBarry
4. Loren Cook
5. Engineer approved equal.

B. Style: Gravity Hood Ventilator

C. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

D. Fabricate of aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced with removable hood and birdscreen with 1/2 inch aluminum square mesh. Factory [prime coat] [baked enamel] [anodized] [fluoropolymer spray or acrodized] [_____] finish. Color to be selected by architect.

E. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.

F. Hood outlet area shall be minimum of twice throat area.

2.04 GOOSENECKS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, of minimum 18 gauge galvanized steel.

B. Mount on minimum 12 inch high curb base where size exceeds 9 inch x 9 inch.

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 and type to conform to architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, despite whether dampers are specified as part of the diffuser or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Provide a cable operated damper or access panel where a balancing damper is located above gypsum ceilings or in an inaccessable location. Externally cable operated damper shall be similar to Ruskin ZCDR25.

3.02 SCHEDULES

A. See drawings.

END OF SECTION 23 37 00

SECTION 23 54 00

FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnaces

B. Condensing units

C. Economizer damper units

D. Thermostats

1.02 RELATED SECTIONS

A. Specification Section 23 05 13 - Common Motor Requirements for HVAC Equipment

B. Specification Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

C. Specification Section 23 0553 – Identification for HVAC Piping and Equipment

D. Specification Section 23 07 13 - Duct Insulation

E. Specification Section 23 0913 – DDC Instruments and Control Devices for HVAC

F. Specification Section 23 1123 – Natural Gas and Propane Piping

G. Specification Section 23 2300 – Refrigerant Piping and Specialties

1.03 REFERENCES

A. ANSI/AHRI 210/240 - Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment

B. ANSI/AHRI 270 - Sound Rating of Outdoor Unitary Equipment

C. ANSI/AHRI 520 – Performance Rating of Positive Displacement Condensing Units

D. ANSI/AHRI 610 – Performance Rating of Central System Humidifiers for Residential Applications

E. ASHRAE 23 – Methods of Testing for Rating the Performance of Positive Displacement Refrigerant Compressors and Condensing Units That Operate at Subcritical Temperatures

F. ASHRAE 15 - Safety Code for Mechanical Refrigeration

G. ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter

H. ASHRAE 90 - Energy Conservation in New Building Design

I. ASHRAE 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers

J. NFPA 31 - Installation of Oil Burning Equipment

K. NFPA 54 (AGA Z223.1) - National Fuel Gas Code

L. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

M. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems

N. NFPA 211 - Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances

O. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical

P. UL 727 - Oil-Fired Central Furnaces

Q. UL 729 - Oil-Fired Floor Furnaces

1.04 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data and wiring diagrams and unit supports.

B. Shop Drawings: Indicate assembly, required clearances, location and size of field connections.

C. Design Data: Indicate refrigerant pipe sizing and routing.

D. Manufacturer's Instructions: Indicate rigging, assembly and installation instructions.

E. Project Record Documents: Record actual locations of components and connections.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in owner's name and registered with manufacturer.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Comprehensive parts and labor warranty for furnace, condensing unit and thermostat for 12 months after start of beneficial use by owner or 18 months after date of shipment from factory, whichever is sooner.

B. Parts warranty for compressor from end of comprehensive warranty until four years later.

C. Parts warranty for heat exchanger from end of comprehensive warranty until nine years later.

D. Warranties must not be pro-rated.

PART 2 PRODUCTS

2.01 FURNACES (GAS FIRED)

A. Manufacturer:
1. Lennox
2. Carrier
3. Trane
4. Heil
5. York
6. Engineer approved equal.

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, [natural gas heating section], [heating element], controls, [electronic air filter], [humidifier], and accessories; wired for single power connection with control transformer.

C. Airflow Configuration: See schedule on drawings.

D. Heating: [Single stage natural gas fired], [Two stage natural gas fired].

E. Electric Refrigeration: Refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.

F. Accessories: See schedule on drawings.

G. Provide with factory external filter cabinet with one inch (1”) thick MERV 6 filter.

H. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, fiberglass insulation with reflective liner.

I. Supply Fan: Centrifugal type rubber mounted.

J. Motor: PSC, permanently lubricated.

K. Heat Exchanger: Aluminized steel welded construction with aluminum finned stainless steel tube condensing coil.

L. Gas Burner:
1. Sealed combustion with blower.
2. Gas valve provides 100% safety gas shut-off; 24 volt combining pressure regulation, safety pilot, pilot filtration, and automatic electric valve.

3. Electronic pilot ignition with electric spark igniter.
4. Non-corrosive combustion air blower with permanently lubricated motor.

M. Gas Burner Safety Controls:
1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

N. Operating Controls:
1. Room Thermostat: Cycles burner to maintain room temperature setting.
2. Supply Fan Control: Energize from bonnet temperature independent of burner controls with adjustable timed off delay and fixed timed on delay with manual switch for continuous fan operation.

O. Performance:
1. Ratings: Energy Efficiency Rating (EER) not less than requirements of ASHRAE 90A; seasonal efficiency to ASHRAE 103.
2. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

2.02 CONDENSING UNITS

A. Manufacturer:
1. Match furnace manufacturer.

B. Construction and Ratings: In accordance with ANSI/AHRI 210/240, and UL 207. Testing: ASHRAE 14.

C. Compressor: ANSI/AHRI 520; Scroll; hermetic, resiliently mounted integral with condenser with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.

D. Refrigeration Accessories: Filter drier, high pressure switch, low pressure switch, service valves and gauge ports, and thermometer well. Provide refrigerant lines, factory cleaned, dried, pressurized and sealed with insulated suction line.

E. Air Cooled Condenser: ANSI/AHRI 520; aluminum fin and copper tube coil with direct drive axial propeller fan resiliently mounted, and galvanized fan guard. See capacity schedule on the drawings.

F. Electrical Characteristics: See schedule on the drawings.

G. Disconnect Switch: Field mounted disconnect by electrical contractor.

H. Refrigeration Operating Controls:
1. Room Thermostat: Cycles condensing unit and supply fan to maintain room temperature setting.
2. Low Ambient Kit: Provide low ambient controls to allow compressor to start and run at 30°F.

2.03 ECONOMIZER DAMPER UNITS

A. Cabinet: Steel with baked enamel finish, easily removed and secured access doors, fiberglass insulation.

B. Dampers: Formed steel with nylon bearings and gaskets.

C. Dampers Operator: Modulating spring return 24-volt motor with adjustable minimum position switch.

D. Air Flow Capacity: See schedule on drawings.

E. Controls: Room thermostat, discharge air thermostat, adjustable outdoor air "enthalpy" control, return air "enthalpy" sensor position dampers. Provide wiring harness consisting of control board with relays, transformer, and hardware.

2.04 THERMOSTATS

A. Manufacturer:

1. Honeywell Vision Pro 8000
2. Lennox Comfortsense
3. White-Rodgers
4. Engineer approved equal.

B. Electric Solid State Micro-Computer Based Room Thermostat:

[**NOTE TO SPECIFIER**: If using an economizer, a two stage cool thermostat must be utilized.]

1. Minimum of [one][two][three][four] stage[s] of [gas][electric] heat and [one][two] stage[s] of cooling.

   [**NOTE TO SPECIFIER**: If using an economizer, a two stage cool thermostat must be utilized.]
2. Touch screen.
3. Preferential rate control to minimize overshoot and deviation from setpoint.
4. Set-up for four separate temperatures per day.
5. Instant override of setpoint for continuous or timed period from one hour to 31 days.
6. Short cycle protection.
7. Programming based on every day of the week.
8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, and fan on-auto.
9. Battery replacement without program loss.
10. Heat pump compressor lockout.
11. Keypad lockout.
12. Early startup capabilities to reach setpoint at desired time of day.
13. Thermostat Display:
    a. Time of day.
    b. Actual room temperature.
    c. Programmed temperature.
    d. Programmed time.
    e. Duration of timed over ride.
    f. Day of week.
    g. System Mode Indication: Heating, cooling, auto, off, fan auto, fan on.
        1) If schedule is in occupied, cycle the fan with heating or cooling demand.
           [**NOTE TO SPECIFIER**: Fan run days based on call for fan]
        2) Remind user to replace filter after [10][30][60][90][120][365] fan run days.
        3) Remind user to replace humidifier filter after [90][180][365] calendar days.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the floors are ready for installation of units and openings are as indicated on the shop drawings.

B. Verify proper power supply is available for furnace and condenser package.

C. Verify proper fuel supply is available for connection.

D. Verify water supply is available for humidifier.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired furnaces in accordance with ANSI Z223.1 NFPA 54.

C. Provide vent connections in accordance with NFPA 211.

D. Install refrigeration systems in accordance with ASHRAE 15.

E. Mount furnaces on 4” concrete pad with neoprene vibration isolators.

F. Mount air-cooled condensing unit on four-inch concrete pad on grade or on rooftop supports. See drawings for location.

G. [FMS Contractor] [This contractor] is responsible for all control wiring.

H. Provide a one-hour enclosure around PVC intake and vent piping located in a ceiling return air plenum.

I. Insulate vent and intake piping in attic space in accordance to manufacturer's recommendations.

J. Provide a lockable, clear enclosure to surround the thermostat.

K. All thermostats shall be installed per all applicable ADA Codes and Guidelines.

L. Pipe drain from cooling coils and humidifiers to nearest floor drain. Install per manufacturer’s instructions.

M. Refrigerant piping shall be sized and installed per manufacturer requirements. Provide necessary accessories for long-line application as required.

END OF SECTION 23 54 00

SECTION 23 55 33
FUEL FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gas fired unit heaters

B. High intensity infrared heaters (Vantage)

C. High intensity infrared heaters (Co-Ray Vac)

D. Room thermostats

1.02 RELATED SECTIONS

A. Specification Section 23 05 13 - Common Motor Requirements for HVAC Equipment

B. Specification Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

C. Specification Section 23 07 13 - Duct Insulation

D. Specification Section 23 09 13 - Instruments and Control Devices for HVAC

E. Specification Section 23 51 00 - Breechings, Chimneys, and Stacks

1.03 REFERENCES

A. ASHRAE 103 - Heating Seasonal Efficiency of Central Furnaces and Boilers, Methods of Testing

B. NEMA MG 1 - Motors and Generators

C. NFPA 54 (AGA Z223.1) - National Fuel Gas Code

D. NFPA 70 - National Electrical Code

E. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

F. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems

G. NFPA 211 - Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, locations and sizes of field connections.

C. Manufacturer's Instructions: Indicate rigging, assembly and installation instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance, repair data and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in owner's name and registered with manufacturer.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Provide manufacturers warranty for heat exchangers.

1.07 EXTRA MATERIALS

A. Provide one set of filters to be installed when heating units are turned over to the owner.

PART 2 PRODUCTS

2.01 GAS FIRED UNIT HEATERS

A. Manufacturer: See schedule on drawings.

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:

C. Heating: Natural gas fired.

D. Discharge Louvers: Individually adjustable [horizontal] [vertical] louvers to match cabinet finish.

E. Downturn Nozzle: Nozzle to match outlet and cabinet finish where applicable.

F. Poly-Tube Outlet Adapter: Transition duct to adapt from unit outlet to round outlet flange for polyethylene tube duct where applicable.

G. Cabinet: Galvanized steel with baked enamel finish easily removed and secured access doors, fiberglass insulation and reflective liner.

H. Supply Fan: As per schedule on drawings.

I. Heat Exchanger: Aluminized steel welded construction.

J. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply,
   2. Gas valve, two stage provides 100% safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (on-off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition with [electric spark] [hot surface] igniter.
   4. Combustion air damper with synchronous spring return damper motor.
   5. Non-corrosive combustion air blower with permanently lubricated motor.

K. Gas Burner Safety Controls:
   1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Flame Roll Out Switch: Installed on burner box and prevents operation.
   3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

L. Operating Controls:
   1. Room Thermostat: Cycles burner to maintain room temperature setting.
   2. Supply Fan Control: Energize from bonnet temperature independent of burner controls with adjustable timed off delay and fixed timed on delay with manual switch for continuous fan operation.

M. Performance: See schedule on drawings.

2.02 HIGH INTENSITY INFRARED HEATERS (VANTAGE)

A. Manufacturer:
   1. Roberts Gordon
   2. Engineer approved equal.

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, heat exchanger, burner, reflector, controls.

C. Cabinet: Galvanized steel with baked enamel finish/sealed burner box.

D. Tube: Heat treated aluminized steel tube.

E. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply,
   2. Gas valve provides 100% safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (on-off), pilot filtration, automatic electric valve.
   3. Electronic hot surface ignition with safety shut-off provided by manufacturer.

F. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

G. Room Thermostat: 120V line voltage Vantage III CTH3 zone sensor (BASE BID). 24-volts (ALTERNATE BID) to control burner and lower operation.

H. Performance: Refer to schedule on drawings.

I. Provide Class B gas vent pipe and bird proof roof cap and terminate in accordance to manufacturer's recommendations.

J. Provide insulated combustion air duct with bird proof intake roof cap and terminate in accordance to manufacturer recommendations.

2.03 HIGH INTENSITY INFRARED HEATERS (CO-RAY VAC)

A. Co-Ray-Vac Equipment: The total heating system supplied shall be design certified by the American Gas association and this per American National Standard Z83.6 (latest edition).

B. Burner and Burner Controls:
   1. Burners shall be designed to fire simultaneously in series without adverse affects from combustion gasses from upstream burners.
   2. Burners shall be capable of firing with one of the fuel options as specified on the purchase documents: Natural Gas or LP.
   3. Burners shall be supplied to fire at the input firing rates as specified:
      a. CRV-2 20,000 BTU/Hr.
      b. CRV-4 40,000 BTU/Hr.
      c. CRV-6 60,000 BTU/Hr.
      d. CRV-8 80,000 BTU/Hr.
      e. CRV-9 90,000 BTU/Hr.
      f. CRV-10100,000 BTU/Hr.
      g. CRV-12A110,000 BTU/Hr.
      h. CRV-12120,000 BTU/Hr.
   4. The design of burners supplied shall provide for maintaining a constant proportion of fuel gas to filtered combustion air. These conditions are meant for burners in which the pressure of both the fuel gas and the combustion air are introduced at zero (atmospheric) pressure and the flow of each is established by a vacuum on the downstream side of the flow metering orifices.
   5. To assure a high degree of fail-safe operation, the design shall preclude flow of gas if any or all of the following abnormal conditions occur in the non-firing mode:
      a. Main valve fails in open position.
      b. Vacuum pump motor fails to operate.
      c. Power fails.
   6. To further assure a high degree of safety, the system will be under negative pressure at all times during operation to preclude the possibility of the escape of combustion gases inside the building.
   7. The burner control assembly will always include a zero regulator.

C. Burner: Each burner assembly shall consist of safety, the system will be under negative pressure at all times during operation to preclude the possibility of the escape of combustion gases inside the building.

D. Heat Exchanger:
   1. Radiant tubing (between burners and 10 to 40 feet downstream of last burner) shall be of four inch (4") O.D. steel or heat treated aluminized tubing.
   2. The balance of the tubing shall be four inch (4") O.D. steel tubing with a double coating of acid-resistant porcelain. (Internal/external coating.
   3. All heat exchanger (tubing) connections shall be made with stainless steel coupling assemblies. Unlined coupling will be used with uncoated tubing or to connect uncoated to coated tubing. Lined couplings will be used to connect coated to coated tubing.

E. System Control:

1. All burners shall be pre-wired with a grounded electrical cord and plug.
2. When specified, provide a solid-state electronic control panel to facilitate zone temperature control for up to four zones. Smaller systems (as defined by electrical requirements) may be controlled with a thermostat and relay,

F. Outside Air: The system shall obtain combustion air from the room.

G. Room Thermostat: Low voltage, to control burner operation.

H. Provide ducted combustion air and insulated duct with bird proof intake cap.

I. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, heat exchanger, burner, reflector, controls.

J. Cabinet: Galvanized steel with baked enamel finish.

K. Ceramic Emitter: Assembly of high temperature ceramic tiles with stainless steel housing and reflector.

L. Gas Burner:
1. Atmospheric type with adjustable combustion air supply,
2. Gas valve provides 100% safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (on-off), pilot filtration, automatic electric valve.
3. Electronic pilot ignition with igniter provided by manufacturer.

M. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

N. Room Thermostat: Low voltage to control burner operation.

O. Performance: Refer to schedule on drawings.

P. Provide Class B gas vent pipe and bird proof wall cap.

2.04 ROOM THERMOSTATS

A. Manufacturer:
1. Honeywell
2. Engineer approved equal.

B. Adjustable Room Thermostat: Low voltage, to control burner operation, heater stages in sequence with delay between stages, compressor and condenser fan and supply fan to maintain temperature setting. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

C. Electric Solid State Microcomputer Based Room Thermostat with Remote Sensor:
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from setpoint.
3. Set-up for four separate temperatures per day.
4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. Programming based on every day of the week.
7. Selection features including deg F or deg C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan-on-auto.
8. Battery replacement without program loss.
9. Thermostat Display:
   a. Time of day.
   b. Actual room temperature.
   c. Programmed temperature.
   d. Programmed time.
   e. Duration of timed over ride.
   f. Day of week.
   g. System Mode Indication: Heating, cooling, auto, off, fan auto, fan on.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired units to NFPA 54.

C. Provide vent connections to NFPA 211.

D. Provide type "B" gas flue with flashing and bird proof cap.

E. Install unit heaters and/or packaged air units with vibration isolation.

F. Provide operating controls.

G. Provide connection to electrical power systems.

3.03 SCHEDULES

A. See drawings.

END OF SECTION 23 55 33

SECTION 23 81 01

TERMINAL HEAT TRANSFER, CONVECTION HEATING, AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric wall heaters

B. Electric unit heaters

1.02 RELATED SECTIONS

A. Specification Section 23 0993 - Sequence of Operation for HVAC Controls

B. Specification Section 23 2300 - Refrigerant Piping

1.03 REFERENCES

A. NFPA 70 - National Electrical Code

B. UL 303 - Refrigeration and Air-Conditioning Condensing and Compressor Units

1.04 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valve.

E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three-years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. Provide one-year manufacturer’s warranty for condensing units and compressors.

PART 2 PRODUCTS

2.01 ELECTRIC WALL HEATERS

A. Manufacturers:
   1. Berko
   2. Heatrex
   3. Indeeco WAI
   4. Markel
   5. Raywall
   6. Brasch
   7. Engineer approved equal.

B. Coils: Industrial grade steel finned tubular elements.

C. Cabinet: 18 gauge steel housing (4-1/2” deep) with Extruded aluminum heavy duty architectural grille. Provide surface, recessed, or semi-recessed mount kit. Confirm mounting type with the design team.

D. Finish: Polyester powder paint finish. [Architect shall select color from standard color chart.] [Custom color shall be selected by Architect.]

E. Fans: Propeller fan, statically and dynamically balanced, direct driven, permanently lubricated bearings.

F. Motor: Permanently lubricated, totally enclosed motor.

G. Control: [Integral thermostat with Fan On/Auto switch.] [Low voltage relay for connection to FMS. Refer to Specification Section 23 0993 - Sequence of Operation.]

H. Electrical: Integral disconnect switch.

I. Submit color chart for architectural approval.

2.02 ELECTRIC UNIT HEATERS

A. Manufacturers:
1. Berko
2. Heatrex
3. Indeeco
4. Markel
5. QMark
6. Raywall
7. Brasch
8. Engineer approved equal.

B. Heating Elements: Industrial grade stainless steel tubular elements in 2-10 KW units and steel finned tubular elements in 15-60 KW units.

C. Cabinet: 18 gauge galvanized steel with polyester powder coat finish. Color as selected by the architect.

D. Outlet Grille: Adjustable louvers with protective mesh screen.

E. Fan: Direct drive propeller type statically and dynamically balanced with permanently lubricated bearings.

F. Motor: Blow through, totally enclosed, thermally protected motor.

G. Mounting: Factory assembled wall or ceiling hanger.

H. Control: [Integral thermostat] [Provided with wall mounted thermostat.] [Low voltage relay for connection to FMS. Refer to Specification Section 23 0993 - Sequence of Operation.]

I. Electrical: Manufacturer’s integral disconnect switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Unit Heaters: Hang from building structure with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

E. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

F. Units with Cooling Coils: Provide drain pan with indirect connection to condensate drain.

G. Install electric heating equipment, including devices furnished by the manufacturer, but not factory mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.

H. Install refrigeration systems in accordance with ASHRAE 15.

I. Mount air-cooled condensing unit on rooftop supports. See drawings on location.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of all units. Vacuum clean the coils and inside of the cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

C. Install new filters.

3.03 SCHEDULES

A. See drawings.

END OF SECTION 23 81 01

SECTION 23 81 26
DUCTLESS SPLIT SYSTEM UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single zone unit

B. Multi zone units

1.02 RELATED SECTIONS

A. Specification Section 23 0993 - Sequence of Operation for HVAC Controls

B. Specification Section 23 2300 - Refrigerant Piping

1.03 REFERENCES

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment

B. AHRI 270 - Standard for Sound Performance Rating of Outdoor Unitary Equipment

C. AHRI 365 - Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units

D. ASHRAE 15 - Safety Standard for Refrigeration Systems

E. ASHRAE 90.1 - Energy Standard for Buildings except Low-Rise Residential Buildings

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

G. NEMA MG 1 - Motors and Generators

H. NFPA 70 - National Electrical Code

I. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical

J. UL 1995 - Heating and Cooling Equipment

1.04 SUBMITTALS

A. Product Data: Provide typical catalog of information including rated capacities, furnished specialties, accessories, and arrangements.

B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valve.

E. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, Article100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio and Coefficient of Performance: Equal to or greater than prescribed by ASHRAE90.1.

D. The system components must be tested in accordance with the AHRI standard that applies to the particular component. All outside unit sound data presented must be determined using AHRI 270 methods.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. or ETL, as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. Provide five-year manufacturer’s parts and defects warranty from time of installation.

PART 2 PRODUCTS

2.01 SINGLE ZONE SYSTEM

A. Manufacturers
   1. Daikin
   2. Fujitsu
   3. Friedrich
   4. LG
   5. Mitsubishi
   6. Panasonic
   7. Samsung
   8. Engineer approved equal.

B. Summary: [Heat Pump] [Cooling only] split-system air conditioning consisting of separate evaporator-fan and compressor-condenser components. Units shall be a variable capacity, single zone system.

C. Indoor Units: Self contained fully factory assembled, wired and run tested prior to shipment. Contained within the indoor unit shall be all factory wiring, piping, control circuit board, fan, and fan motor. The unit shall have a self-diagnostic function, 3-minute restart time delay mechanism, an auto restart function, an emergency / test operation. Indoor unit shall be charged with dry air before shipment from factory.
   1. Cabinet:
      a. The cassette cabinet shall be of galvanized steel construction with high density foam insulation.
      b. The cassette face shall have a white finish.
      c. The cassette shall be capable of four direction adjustable air discharge.
      d. The cassette cabinet shall have a have knock-out provisions for a ventilation air intake connection.

         [OR]

      e. The wall mounted cabinet shall be of ridged polymer construction, have a white finish, adjustable air discharge, and integral mounting bracket.
   2. Fan:
      a. The indoor unit fan shall be an assembly with a direct driven fan powered by a single motor.
      b. The fan shall be statically and dynamically balanced with permanently lubricated bearings.
      c. The indoor fan shall have no less than three fan speeds.
   3. Filter:
      a. Return air shall be filtered by means of an easily removed, washable, mold resistant filter.
   4. Coil:
      a. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.

b. All tube joints shall have corrosion resistant alloy brazing.
c. The coils shall be pressure tested at the factory.
d. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.
e. Provide a condensate pump with 20” of lift for discharge of condensate from drain pan.
f. The condensate pump shall be mounted within the indoor unit casing.

5. Electrical:
   a. The indoor unit shall be powered and controlled directly from the outdoor unit providing both primary power and integrated, by-directional, digital control signal.
   b. Indoor unit shall have a wall mounted and hard wired thermostat as shown on the drawings.

D. Outdoor Units:
1. General: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
2. Unit Cabinet:
   a. The casing shall be fabricated of galvanized steel with powder coating for corrosion protection. Assembly hardware shall be cadmium plated or stainless steel.
   b. Mounting feet, traverse mounted across the cabinet base pan, welded mount.
3. Fan:
   a. The unit shall be furnished with a direct drive, propeller type fan.
   b. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings.
   c. The fan motor shall be mounted with vibration isolation for quiet operation.
   d. The fan shall be provided with a guard to prevent contact with moving parts.
4. Coil:
   a. The outdoor unit coil shall be cooper with aluminum fins.
   b. The coil shall be protected with an integral guard.
   c. Refrigerant flow from the outdoor unit to the indoor units shall be independently controlled by means of an electronic linear expansion valve.
   d. Outdoor unit shall be pre-charged with sufficient R-410a to run the system.
   e. All refrigerant piping between the outdoor and indoor units shall be sized per the manufacturer’s recommendations.
5. Compressor:
   a. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type.
   b. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
   c. The outdoor unit shall be equipped with a suction side refrigerant accumulator.
   d. The compressor will be equipped with an internal thermal overload.
   e. The compressor shall be mounted to avoid the transmission of vibration.
   f. The compressor shall have a low ambient kit to allow cooling down to 0 deg F.

2.02 MULTIPLE ZONE SYSTEM

A. Manufacturers
1. Daikin
2. Fujitsu
3. Friedrich
4. LG
5. Mitsubishi
6. Panasonic
7. Engineer approved equal.

B. Summary: [Heat Pump] [Cooling only]] split-system air conditioning consisting of separate evaporator-fan and compressor-condenser components. Units shall comprise a variable capacity, multi- zone systems.

C. Indoor Units: Self contained fully factory assembled, wired and run tested prior to shipment. Contained within the indoor unit shall be all factory wiring, piping, control circuit board, fan, and fan motor. The unit shall have a self-diagnostic function, 3-minute restart time delay mechanism, an auto restart function, an emergency / test operation. Indoor unit shall be charged with dry air before shipment from factory.
   1. Cabinet:
      a. The cassette face shall have a white finish.
      b. The cassette shall be capable of four direction adjustable air discharge.
      [OR]
      c. The wall mounted cabinet shall be of ridged polymer construction, have a white finish, have adjustable air discharge, and integral mounting bracket.
   2. Fan:
      a. The indoor unit fan shall be an assembly with a direct driven fan powered by a single motor.
      b. The fan shall be statically and dynamically balanced with permanently lubricated bearings.
      c. The indoor fan shall have no less than three fan speeds.
   3. Filter:
      a. a. Return air shall be filtered by means of an easily removed, washable, anti-mold filter.
   4. Coil:
      a. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.
      b. All tube joints shall be brazed.
      c. The coils shall be pressure tested at the factory.
      d. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.
      e. Provide a condensate pump with 20” of lift for discharge of condensate from drain pan.
      f. The condensate pump shall be mounted within the indoor unit casing.
      g. Provide with condensate overflow switch.
   5. Electrical:
      a. The indoor unit shall be powered and controlled directly from the outdoor unit providing both primary power and integrated, by-directional, digital control signal.
      b. Each system shall have a wall mounted and hard wired thermostat as shown on the drawings.

D. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Unit Cabinet:
      a. The casing shall be fabricated of galvanized steel with powder coating for corrosion protection.
      b. Assembly hardware shall be cadmium plated or stainless steel.
      c. Two steel mounting feet, traverse mounted across the cabinet base pan, welded mount.
   2. Fan:
      a. The unit shall be furnished with a direct drive, propeller type fan.
      b. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings.
      c. Fan speed shall be switch automatically according to the number of operating indoor units and the compressor operating frequency.
      d. The fan motor shall be mounted with vibration isolation for quiet operation.

e. The fan shall be provided with a raised guard to prevent contact with moving parts.

3. Coil:
   a. The outdoor unit coil shall be cooper with aluminum fins.
   b. The coil shall be protected with an integral guard.
   c. Refrigerant flow from the outdoor unit to the indoor units shall be independently controlled by means of individual electronic linear expansion valves for each indoor unit.
   d. Outdoor unit shall be pre-charged with sufficient R-410a to run the system.
   e. All refrigerant piping between the outdoor and indoor units shall be sized per the manufacturer's recommendations.
4. Compressor:
   a. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type.
   b. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
   c. The outdoor unit shall be equipped with a suction side refrigerant accumulator.
   d. The compressor will be equipped with an internal thermal overload.
   e. The compressor shall be mounted to avoid the transmission of vibration.
   f. The compressor shall have a low ambient kit including wind baffles to allow cooling down to 0 deg F.
5. Manifold:
   a. The outdoor unit for a multi zone system shall have manifold connections providing a separate set of flared fittings for each indoor zone.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Install refrigeration systems in accordance with ASHRAE 15.

E. Mount air-cooled outdoor condensing unit on rooftop supports or ground mounted stand. Refer to manufacturer's instructions for minimum height. See drawings on location.

F. Mechanical contractor shall run control wiring form outdoor unit to each indoor unit. Install wired thermostat as shown on the drawings.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of all units. Vacuum clean the coils and inside of the cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

C. Install new filters.

END OF SECTION 23 81 26

SECTION 26 00 50

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Electrical Division Specification Sections.

B. Division 26 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

C. Division 26 Specification requirements also include, by reference, Specification Section 08 7100 - Door Hardware. Review and inclusion of the electrical requirements of this specification section are included as a part of this contract.

1.02 OWNER OCCUPANCY

A. The owner will occupy the premises during the construction period.

B. Limit use of site and premises to allow owner occupancy.

C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

D. Schedule the work to accommodate this requirement.

1.03 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by themselves, by their employees or through any operation under their charge, whether in the contract or extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:
   1. The National Board of Fire Underwriters
   2. The ANSI-NFPA 70 National Electrical Code
   3. The National Fire Protection Association (NFPA)
   4. The Occupations Safety and Health Act (OSHA)
   5. IBC Building Code (current) and any current applicable city building and or electrical codes.
   6. Fire Protection: Conform to International Fire Code (IFC) and NFPA.
   7. International Energy Conservation Code (IECC)

F. Obtain permits and request inspections from authority having jurisdiction.

G. Conform to latest approved versions of codes.

1.04 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.

C. This contractor, before submitting their bid, shall visit the site of the project to familiarize themselves with locations and conditions affecting their work.

D. It is the intent of this specification that the contractor furnish all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price will be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.

F. This contractor shall provide, as necessary, for the installation of their work and in accordance with materials other than the structure.

1.05 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to ensure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.06 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished, and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.07 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.08 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction, the contractor shall check and verify with the owner each item of existing equipment that must be removed.

B. The owner will designate which items of material or equipment not reused that they may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for their use shall become the property of the contractor and shall be removed from the site.

1.09 PROTECTION AND MAINTENANCE

A. The work covered by these drawings and specifications may involve work in both new and remodeled areas of the building.

B. Where necessary to connect to any existing utility service, this electrical contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

D. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of their work.

E. Coordinate protection requirements with department heads before beginning construction.

F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.10 DEMOLITION

A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be reused".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.
   4. All elements to be removed are subject to the Owner's Right of Salvage.

B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.11 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.

B. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.

C. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.12 DAILY HOUSEKEEPING AND CLEANING

A. At the end of each workday, the contractor shall remove all of their debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor shall not use the owner’s waste disposal facility for the removal of debris from the project.

B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.13 CLEANING AND RUBBISH

A. This contractor, upon completion of their work, shall remove all rubbish and debris resulting from their operation and shall remove it from site at their own expense.

B. As far as their work is concerned, all equipment shall be cleaned and the premises left in first class condition.

C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from their work.

1.14 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
   1. Dow Corning "Silicone RTV Foam"
   2. 3-M Corporation "Fire Barrier Caulk and Putty"
   3. Thomas & Betts "Flame Safe Fire Stop System"

D. Installation of these products are to be in strict accordance with the manufacturer's recommendations.

E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 ELECTRICAL CONNECTIONS

A. This contractor shall mount and wire all magnetic starters, thermal protective switches, and speed changing switches furnished under the mechanical contract and install such starters and switches and wire them to their respective motors as a part of the electrical contract.

B. All other magnetic starter switches, safety switches and speed control devices indicated on the electrical drawings or specifications are the responsibility of the electrical contractor to furnish and install.

C. Unless specifically stated elsewhere, the wiring of the temperature control system shall be the responsibility of the mechanical contractor.

D. The contractor shall provide line voltage power and rough-in for Fire Alarm system. Coordinate required line voltage and installation locations prior to bid.

1.16 HAZARDOUS MATERIALS

A. If the contractor stores any hazardous solvents or other materials on the site, they shall obtain copies of the safety data sheets for the materials and post them at the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.
   1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.17 AS-BUILT DRAWINGS

A. This electrical contractor shall provide (at the conclusion of the project) one clean, non-torn, neat and legible "as-built" set of drawings to the owner. These drawings shall show the routing of conduit, wiring and equipment drawn in at scaled locations. All circuits shall be labeled and shall conform to labeled panel breakers. All dimensions indicated shall be referenced to a column line. A set of construction drawings will be furnished for this work.

B. All electrical panels and electrical installed equipment shall be shown on the "as-built" drawings.

C. Refer to General Specification Sections for additional requirements.

D. This contractor shall update these drawings during the project at least once a week.

1.18 ALTERNATES

A. Refer to description of alternate bids under General Specification Sections.

1.19 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels they propose to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions, and illustration. One of the returned copies shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless the contractor notifies engineer, in writing, of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set. This indicates that each of them have been checked in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted or checked and will be marked "resubmit" and sent back to the contractor.

1.20 TEST OF SYSTEMS

A. This contractor shall, before concealed, test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall be held responsible for all damage resulting from defects in the system.

C. Each individual feeder circuit shall be tested at the panel and in testing for insulation resistance to ground; the power equipment shall be connected for proper operation. In no case shall the insulation resistance to ground be less than that required by the National Electrical Code (NEC).

1.21 SCOPE OF WORK

A. This contractor shall furnish all the labor and material necessary to install a complete electrical system for the building. The system shall include all items of work as outlined in these specifications and on the drawings.

B. All work shall be performed by a well-qualified, licensed electrician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their employees are familiar with all the various codes and tests applicable to this work.

C. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

D. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.

E. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type.

F. This contractor, before proceeding with any work, shall review the architectural drawings. Any conflict between the electrical and architectural drawings shall be reported to the engineer for clarification.

G. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer’s attention and an addendum is issued for clarification.

H. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate.
   3. Electrical bus duct.
   4. Sheet metal.
   5. Cable trays, including access space.
   6. Other piping.
   7. Conduits and wireway.

1.22 ELECTRICAL UTILITY COMPANY

A. Any fees by the utility company are to be billed directly to the owner.

B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.23 TELECOMMUNICATIONS UTILITY COMPANY

A. Any fees by the telecommunications utility company are to be billed directly to the owner.

B. The contractor shall be required to provide pathways to the property easement and/or right-of-way. Final Coordination of conduit routing and termination shall be performed by this contractor while communicating with each telecommunications utility company. This shall include telephone, cable television and internet services to the building.

1.24 WALL CONTINUITY (1 HR.)

A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.

B. Any branch panel in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.25 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. All underground utilities, telephone conduit, parking lot lighting, tunnels, etc shall be exactly located prior to digging. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional information.

1.26 LOW VOLTAGE CONDUIT INSTALLATION

A. This contractor shall install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Caddy Cable CAT. Provide hooks with closure holes and cable ties. Mount hooks three foot (3') on center.

B. This contractor shall install conduit sleeves serving low voltage cables through walls and floors.

C. Refer to other specification sections for additional information.

1.27 TEMPORARY POWER AND LIGHTING

A. Temporary electrical power and lighting necessary for the construction process is the responsibility of the electrical contractor and shall be included in the base bid amount.

1.28 GAS METER

A. This contractor shall provide a 1/2 inch conduit from the interior of the power plant to the gas meter location. This conduit shall be used for telemeter of the natural gas consumption. This conduit shall be galvanized rigid steel and be terminated with bushings. The conduit shall be bonded to the building steel or the grounding system of the electrical system.

B. Install a telephone pair from the meter to the telephone IDF. Provide a conduit and wire 110-volt circuit to gas meter, reuse existing power source. Verify location of gas meter.

1.29 EXTRA MATERIALS AND LABOR [RENOVATION PROJECTS ONLY]

A. The electrical contractor shall include in their bid additional resources for the removal and installation of 10 existing junction boxes in order to maintain access upon completion of construction. Provide new wiring as necessary where length is insufficient to maintain a complete system. The relocation requests may occur anytime during the construction process as requested by the Owner or Design Team. Junction boxes may be associated with Divisions 26, 27 and 28.

1.30 ALLOWANCE

A. Include a $5,000.00 allowance in the bid amount for owner or engineer directed changes during the construction period. Changes shall be priced prior to proceeding with the work. Any amount left over at the conclusion of the project shall be deducted from the contractor's last payment application.

1.31 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement. A service fee for each document transmitted will be assessed to the contractor. Documents will be transmitted upon payment receipt. Current service fee is $100.00 per CAD sheet.

1.32 SECURE NETWORKABLE DEVICES

A. Update network devices to the most current software/firmware.

B. Change default password of all networkable devices.
   1. Passwords shall have at least eight characters.
   2. Include uppercase and lowercase letters, numerals, and special characters

C. Supply MAC address and serial number of all networkable devices.

D. Work with the Owner’s IT department to align to existing IT standards.

E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.33 SYSTEM CONFIGURATION AND PROGRAMMING FILES

A. Supply system configuration and programming files where export is available.

B. Supply uncompiled programming for systems applicable.

C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 26 00 50

SECTION 26 00 51

PRE-BID SUBSTITUTION REQUEST FORM

This document shall be submitted for all MODUS projects where a manufacturer's sales rep requests that additional products be considered where they are not currently listed on the lighting fixture schedule and/or specifications. Where "Engineer Approved Equal" is listed on the fixture schedule, the designer for the project was unable to find a product that matched the performance and/ or aesthetic criteria required. Product submittals shall include notations on any variances so that they are brought to the attention of the designer for consideration.

All substitution requests shall be submitted to the electrical engineer (10) ten business days prior to the project bid date. The electrical engineer contact information can be found on the first page of the MEP cover sheet. If information is not available, please contact MODUS directly at (515) 251-7280 to identify the responsible party.

Refer to the paragraphs below for product submittal requirements. However, only page 2 is to be completed and submitted with the required information.

LIGHTING FIXTURE SUBSTITUTION REQUEST FOR CONSIDERATION:

1. Provide a summary, description, and any discrepancies of the lighting fixture(s) being submitted for consideration. - i.e. "submitting alternate fixtures for cove products", "submitting alternate LED troffer", etc.
2. Summarize any differences that you are aware of for each product: "has 3.5" aperture while 3" was specified", "fixture has slightly lower lumen package but better efficacy", "steel pole instead of aluminum", etc.
3. Provide a list of lighting fixtures being submitted on your company letterhead along with this form at the beginning of the submittal. The list shall include the TYPE, MANUFACTURER and MODEL NUMBER that is being submitted.
4. Submitter shall include a product page for each type(s) being submitted. The product page shall have all parts of the model number identified by highlighting or boxing in the specific components. If these items are not identified, we will not review the submittal request.
5. Submit IES files for all products submitted, re-named with the fixture type being submitted. Photopia or other software created files will not be accepted. ie: TYPE FA.ies

LIGHTING CONTROLS SUBSTITUTION REQUEST FOR CONSIDERATION:

1. Provide a summary, description, and any discrepancies of the lighting control devices being submitted for consideration. ie - "submitting alternate control devices".
2. Please provide and review the sequence of operation located on our lighting drawings that outline the required control methods for each space. It is our expectation that the submitter completely understands the manufacturer's responsibility to make sure all parts and pieces are included is your submittal.
3. Provide manufacturer warranty and commissioning information.
4. Submitter shall include a product page for each type(s) being submitted. The product page shall have all parts of the model number identified by highlighting or boxing in the specific components.

SUMMARY OF OTHER LIGHTING RELATED ITEMS BEING SUBMITTED:

1. This section is for battery packs, inverters or any other items that you would like us to consider where you believe that you have an equivalent product for us to consider. Again, please don't just include "generic" cutsheets – identify exactly what products you are submitting and if there are any differences that we should be aware of.

PROJECT NAME: _____

PROJECT LOCATION: _____

DATE SUBMITTED: _____

BID DATE: _____

ELECTRICAL ENGINEER: _____

FIXTURE SCHEDULE SHEET: _____

LIGHTING FIXTURE SUBSTITUTION REQUEST FOR CONSIDERATION:

Note that if a fixture is approved in our addendum, light fixtures will be approved only with the TYPE and MANUFACTURER listed. It shall be the responsibility of the submitter to verify that all information contained within the submittals after bids are awarded matches the dimensions, lumen outputs, voltages, dimming types, warranties, etc.

LIGHTING CONTROLS SUBSTITUTION REQUEST FOR CONSIDERATION:

SUMMARY OF OTHER LIGHTING RELATED ITEMS BEING SUBMITTED:

END OF SECTION 26 00 51

SECTION 26 00 80

ELECTRICAL SCHEDULE OF VALUES

PART 1 GENERAL

1.01 FORM COMPLETION

A. The successful Electrical Contractor shall complete this form in its entirety within 30 days of receipt of signed contract from the General Contractor, and submit directly to MODUS.

B. This information is confidential and will not be disclosed to any individual outside of MODUS. Data collected will be used in evaluating pay applications.

1.02 OVERALL CONTRACT

Base Electrical Bid	$ _____
Add or deduct accepted alternates, negotiated changes, or other modifications to the contract	$ _____
Total Electrical Bid	$ _____

1.03 SCHEDULE OF VALUES

Utility Service Entrance - Material and Labor	$ _____
Electrical Distribution - Material and Labor	$ _____
Electrical Distribution Installation - Material and Labor	$ _____
Interior Lighting - Material and Labor	$ _____
Exterior Lighting - Material and Labor	$ _____
Wiring Devices - Material and Labor	$ _____
Lighting Control Devices - Material and Labor	$ _____
Total Electrical Bid (Sum of Schedule of Values)	$ _____

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 26 00 80

SECTION 26 00 90

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 26 00 50 - Basic Electrical Requirements "General Provisions" apply to this section.

1.02 SCOPE

A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.

B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.

C. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.

D. This electrical contractor shall remove all abandoned equipment, conduit, supports, equipment curbs and bases associated with the remodeled area unless noted otherwise.

E. This contractor is responsible to provide temporary electrical protection during this project.

1.03 MATERIALS

A. All elements to be removed are subject to the Owner's Right of Salvage.

B. All materials removed shall be the property of the removing contractor and shall be removed from the site by them, unless otherwise specified.

C. The owner may designate and have salvage rights to any material herein demolished by this contractor. It will be the owner's responsibility to designate such salvageable items and remove them prior to the contractor working in that area.

1.04 WORK BY OTHERS

A. Unless specifically noted under other contracts, the electrical contractor shall assume they will perform all required work. In general, the following will be performed by others:
   1. The mechanical contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.

1.05 EXISTING CONDITIONS

A. If any existing fixtures or devices that are to remain are disturbed by operations under this contract, the contractor is required to re-establish continuity of such systems.

B. The electrical contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to removal of equipment and conduit.

C. The electrical contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.

D. Demolition plans are based on casual field observations and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

E. Floor slabs may contain conduit systems. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This includes x-ray or similar non-destructive means. Where conduit is in concrete slab, cut conduit flush with floor, pull out conductors, and plug conduit ends.

F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field-circuiting arrangements and reconnect as necessary.

B. Verify that abandoned wiring and equipment serve only abandoned facilities. Reconnect circuits, as required, to prevent de-energizing of remaining receptacles and lights.

C. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

E. Review existing panels to remain in the area of construction. Notify the design team of any damaged circuit breakers or missing closure plates.

F. Review existing lighting to remain in the area of construction. Notify the design team of any non-functional lamps, ballasts, or electrical parts.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal. Disconnect circuits at the source.

B. Coordinate utility service outage with local utility company.

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. This shall include 600 volt or less systems and low voltage signal circuits.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchover connections. Obtain permission from the owner, at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections as required.

E. Existing Telephone System: Maintain existing system in service.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this section.

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 a blank cover for abandoned outlets that have not been removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization removed equipment.

H. Disconnect and remove abandoned luminaires, brackets, stems, hangers, and other accessories. This contractor shall include in their bid, associated fees for disposal of ballasts and lamps.

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 installation using materials and methods compatible with existing electrical installations or as specified.

L. The electrical contractor is responsible for removal of lamps and ballast from existing fixtures to be demolished. The electrical contractor is to properly dispose of these items in accordance with codes for hazardous materials.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials that remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry.

3.05 INSTALLATION

A. Install relocated materials and equipment.

END OF SECTION 26 00 90

SECTION 26 05 19
ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building wire

B. Wiring connectors

1.02 RELATED SECTIONS

A. Specification Section 26 0553 - Identification for Electrical Systems

B. Specification Section 26 2413 - Distribution Switchgear

C. Specification Section 26 2416 - Panelboards

D. Specification Section 26 2421 - Isolation Power Panelboards

E. Specification Section 27 3200 - Area of Refuge Two-Way Communications System

F. Specification Section 27 5319 - Distributed Antenna System (First Responder)

G. Specification Section 28 3100 - Fire Detection and Alarm

1.03 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association)

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association)

C. NFPA 70 - National Electrical Code

D. Product Data: Provide for each cable assembly type.

E. Test Reports: Indicate procedures and values obtained.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

G. NFPA 92B - Smoke Management for Malls, Atria, and Large Spaces

H. IBC Section 909 - Smoke Control Systems

1.04 SUBMITTALS

A. Project Record Documents: Record actual locations of components and circuits.

B. Project Record Documents: Provide documentation of the manufacturer’s recommended lug torque value for aluminum conductors, the date the lugs were torqued, and installed torque readings.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as indicated.

B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 foot of length shown.

1.08 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Manufacturers:
   1. Okanite
   2. Bell/Hubbell #BICC
   3. American Insulated Wire
   4. General Cable
   5. Southwire
   6. Encore Wire Corporation
   7. Engineer approved equal.

B. Description: Insulated conductor wire.
   1. All wire shall be stranded. Refer to Section 26 0553 Identification for Electrical Systems for conductor color requirements.
   2. Wire sizes #12 AWG and smaller shall be solid. Wire sizes #10 AWG and larger shall be stranded. [UIHC REQUIRED]
      a. Insulation colors for 277/480V shall be as follows: phase A shall be brown, phase B shall be orange, and phase C shall be yellow.
      b. Insulation colors for 120/208V shall be as follows: phase A shall be black, phase B shall be red, and phase C shall be blue.
      c. For conductors that are too large to be provided in the required color install wire markers per the requirements of Section 26 0553 Identification for Electrical Systems.
   3. Provide solid wire pigtails at all wiring devices and lighting control devices.
   4. All branch circuit neutral wires shall have colored stripe to match panel feeder phase wire identification color. [UIHC REQUIRED]

C. Conductor:
   1. Copper
   2. Feeders, where sizing is indicated at the Electrical Riser Diagram, may use compact aluminum equal to Southwire #AlumaFlex® Aluminum (AA-8176) Conductor. [OWNER MUST UNDERSTAND IMPLICATIONS AND APPROVE PRIOR TO USING THIS NOTE.]

D. Insulation Voltage Rating: 600 volts.

E. Insulation: NFPA 70, type #THHN/THWN-2. All cable installation procedures or sizing shall be based on 75 deg C temperature rating.

2.02 WIRING CONNECTORS

A. Split Bolt Connectors:
   1. Burndy
   2. Engineer approved equal.

B. Spring Wire Connectors:
   1. Thomas & Betts
   2. Engineer approved equal.

C. Compression Connectors:
   1. Burndy
   2. Thomas & Betts
   3. Engineer approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

3.02 PREPARATION

A. Completely and thoroughly swab raceway over two inch (2") in size or buried below grade before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire, type #THHN/THWN-2 insulation in raceway. Use type #NMC cable in residential areas where approved for use.

B. Exposed Dry Interior Locations: Use only building wire, type #THHN/THWN-2 insulation in raceway.

C. Above Accessible Ceilings: Use only building wire, type #THHN/THWN-2 insulation in raceway. Use type #NMC cable in residential areas where approved for use.

D. Wet or Damp Interior Locations: Use only building wire, type #THHN/THWN-2 insulation in raceway.

E. Exterior Locations: Use only building wire, type #THHN/THWN-2 insulation, in raceway. Use liquid-tight wiring methods. Use liquid-tight connections.

F. Underground Installations: Use only building wire, type #THHN/THWN-2 insulation, in raceway. Use liquid-tight wiring methods.

G. Interior Installations: Use only building wire, type #THHN/THWN-2 insulation, in raceway.

H. Use wiring methods indicated.

3.04 INSTALLATION

A. Route wire and cable as required meeting project conditions.

B. Install cable in accordance with the NECA "Standard of Installation."

C. Use conductors not smaller than 12 AWG for power and lighting circuits. Only pre-manufactured fixture whips are allowed to be 14 AWG.

D. Use #10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

E. Use #10 AWG conductors for 20 ampere, 208/240 volt branch circuits longer than 200 feet.

F. Provide minimum #8 AWG wiring for exterior lighting and power circuits leaving building.

G. It shall be the responsibility of the electrical contractor to verify all voltage drop and size all wire accordingly.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire #4 AWG and larger.

J. Protect exposed cable from damage.

K. Use suitable cable fittings and connectors.

L. Neatly train and lace wiring inside boxes, equipment and panel boards.

M. Clean conductor surfaces before installing lugs and connectors.

N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

O. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

P. Use split bolt connectors for copper conductor splices and taps, #6 AWG and larger. Tape non-insulated conductors and connector with electrical tape to 150% of insulation rating of conductor.

Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, #8 AWG and smaller.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, #10 AWG and smaller. All connections in exterior hand holes shall have liquidtight connections.

S. Trench and backfill for direct burial cable installation. Install warning tape along entire length of direct burial cable within three inch (3") of grade.

T. Identify and color code wire and cable under provisions of Specification Section 26 0553 - Identification for Electrical Systems. Identify each conductor with its circuit number or other designation indicated.

U. Terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.

V. Do not install multi-wire branch circuits. No sharing of neutral shall be permitted.

W. Install all conductors and make final connections in accordance with all manufacturer's recommendations.

X. Circuits indicated as 3-pole and having ECM motor loads shall include a neutral conductor.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION 26 05 19

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rod electrode and conductors

B. Mechanical connectors

C. Wire

D. Grounding well components

E. Ground enhancement material

1.02 RELATED SECTIONS

A. Specification Section 27 0526 - Grounding and Bonding for Communication Systems

1.03 SUBMITTALS

A. Product data and manufacturer's installation instructions for non-approved manufacturers shall be submitted for review prior to the bid date.

B. Submittals shall include:
   1. Dimensional drawing for each planned device.
   2. Exothermic Connection Certification for installers.

1.04 SUMMARY

A. Provide all labor, materials, and equipment necessary to properly install a grounding system conductor in all new branch wiring and feeder installations, which shall be in full compliance with all applicable codes as accepted by the authorities having jurisdiction. The secondary distribution system shall include a grounding conductor in all raceways in addition to the return path of the metallic conduit.

B. In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated or bare copper system grounding conductor in accordance with specific rules of Article 250 of the NEC and local codes. The bonding conductor through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices.

C. All raceways shall have an insulated copper system ground conductor throughout the entire length of circuit installed within conduit in strict accordance with NEC. The grounding conductor shall be included in total conduit fill determining conduit sizes, even though not included or shown on drawings. All grounding conductors that run with feeders in PVC conduit outside of building shall be bare only.

D. Provide and install all grounding and bonding as required by the National Electrical Code (NEC) including but not limited to Article 800 of the NEC.

1.05 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code

B. NFPA 99 - Health Care Facilities

C. The Joint Commission

D. Iowa Administrative Code, Chapter 61

E. IEEE 837-2014: Standard for Qualifying Permanent Connections Used in Substation Grounding

F. IEEE Emerald Book

G. IEEE Green Book

1.06 PROJECT RECORD DOCUMENTS

A. Submit record documents to accurately record actual locations of grounding electrodes.

B. Submit test results of each ground rod.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 ROD ELECTRODE AND CONDUCTORS

A. Material: Copper-clad steel.

B. Diameter: 5/8 inch.

C. Length: 10 feet (min). Increase number and/or lengths of ground rod electrodes as required to meet and achieve specified resistance.

D. Maintain separation of not less than eight foot (8') and not more than 20 feet between ground rod electrodes.

2.02 MECHANICAL CONNECTORS

A. All grounding connectors shall be in accordance with UL 467 and UL listed for use with rods, conductors, reinforcing bars, etc., as appropriate.

B. Connectors and devices used in the grounding systems shall be fabricated of copper or bronze materials, and properly applied for their intended use. All connectors and devices shall be compatible with the surfaces being bonded and shall not cause galvanic corrosion by dissimilar metals.

C. Lugs: Substantial construction, of cast copper or bronze with "ground" (micro-flat) surfaces, twin clamp, and two-hole tongue equal to Burndy QQA Series.

D. Grounding and Bonding Bushings: Malleable iron.
   1. Manufacturers:
      a. Thomas & Betts
      b. Engineer approved equal.

E. Piping Clamps: Burndy GAR-TC Series with a two-hole compression terminal.

F. Grounding Screw and Pigtail: Raco #983.

G. Building Structural Steel: Thompson #701 Series heavy duty bronze "C" clamp with two-bolt vise-grip cable clamp or equal.

H. Mechanical lugs or wire terminals shall be used to bond ground wires together or to junction boxes and panel cabinets.

2.03 WIRE

A. Material: Stranded copper.

B. Size to meet NFPA 70 requirements as a minimum. Increase size if called for on drawings or in these specifications.

C. Insulated THWN (or bare as noted elsewhere).

2.04 GROUNDING WELL COMPONENTS

A. Well: 12"x12"x12" Eritech inspection well, Quazite box, or engineer approved equal.

B. Well Cover: Bolt attachment, skid resistant with "GROUND" embossed on cover, suitable for designated traffic rating. Verify with engineer.

C. Material: Polymer concrete with a minimum 10,000lb. load rating.

D. Increase depth or size as required to provide proper access at installed location.

2.05 GROUNDING ENHANCEMENT MATERIAL

A. Erico #GEM25A or engineer approved equal.

B. Product shall meet IEC 62561-7.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's instructions.

B. Install grounding electrodes conductor, bonding conductors, ground rods, etc. with all required accessories.

C. Grounding shall meet (or exceed as required to meet these specifications) all the requirements of the N.E.C., the NFPA, and applicable standards of IEEE.

D. Where there is a conflict between these specifications and the above applicable codes/standards or between this section of these specifications and other sections, then the most stringent or excessive requirement shall govern. Where there is an omission of a code/standard requirement in these specifications then the current code/standard requirements shall comply.

E. Requirement in these specifications to comply with a specific code/standard article, etc. is not to be construed as deleting of requirements of other applicable codes/standards and their articles, etc.

3.02 GROUNDING ELECTRODES

A. All connections shall be exothermic welded unless otherwise noted herein. All connections above grade and in accessible locations may be by exothermic clamping with devices UL listed as suitable for use except in locations where exothermic welding is specifically specified in these specifications or called for on drawings.

B. Each rod shall be die stamped with identification of manufacturer and rod length.

C. Install rod electrodes at locations indicated and/or as called for in these specifications.

D. Ground Resistance:
   1. Main Electrical Service (to each building) and Generator Locations:
      a. Grounding resistance measured at each main service electrode system and at each generator electrode system shall not exceed 5 ohms. [3 ohms. UIHC REQUIRED]
      b. Other Locations:
         1) Resistance to ground of all non-current carrying metal parts shall not exceed 5 ohms measured at motors, panels, busses, cabinets, equipment racks, light poles, transformers, and other equipment.
         2) Resistance called for above shall be maximum resistance of each ground electrode prior to connection to grounding electrode conductor. Where ground electrode system being measured consists of two or more ground rod electrodes then the resistance specified above shall be the maximum resistance with two or more rods connected together but not connected to the grounding electrode conductor.

E. Install additional rod electrodes as required to achieve specified resistance to ground (specified ground resistance is for each ground rod location prior to connection to ground electrode conductor).
   1. Provide grounding well with cover at each rod location. Install grounding well top flush with finished grade.
   2. Verify that final backfill and compaction has been completed before driving rod electrodes.
   3. Install ground rods not less than one foot (1') below grade level and not less than two feet (2') from structure foundation.

3.03 GROUNDING ELECTRODE CONDUCTOR

A. Conductor shall be sized to meet or exceed the requirements of NEC 250 to meet these specifications and/or drawings.

3.04 GROUNDING CONDUCTORS

A. Grounding conductors shall be provided with every circuit to meet (or exceed as required to meet these specifications and/or drawings) the requirements of NEC 250.

B. At every voltage level, new portions of the electrical power distribution system shall be grounded with a dedicated copper conductor, which extends from termination back to power source in supply panelboard.

C. Provide separate, insulated (bare if with feeder in PVC conduit outside of building) conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug.

D. Except as otherwise indicated, each feeder raceway on the load side of the service entrance shall contain a ground conductor sized as indicated and where not shown shall be sized to meet (or exceed as required) these specifications and/or drawings the requirements of NEC 250. The conductor shall be connected to the equipment grounding bus in switchboards and panelboards, to the grounding bus in all motor control centers, and as specified to lighting fixtures, motors, and other types of equipment and outlets. The ground shall be in addition to the metallic raceway and shall be properly connected thereto, using a lug device located within each item enclosure at the point of electric power connections to permit convenient inspection.

E. Provide green insulated ground wire for all receptacles and for equipment of all voltages. In addition to grounding strap connection to metallic outlet boxes, a supplemental grounding wire and screw equal to Raco No. 983 shall be provided to connect receptacle ground terminal to the box.

F. All plug strips and metallic surface raceway shall contain a green insulation ground conductor from supply panel ground bus connected to grounding screw on each receptacle in strip and to strip channel. Conductor shall be continuous.

G. Where integral grounding conductor is specified elsewhere in bus duct construction, provide equivalent capacity conductor from supply switchboard or panelboard grounding bus to the bus duct grounding conductor. Bond integral conductor to bus duct enclosure at each tap and each termination.

H. All motors, all heating coil assemblies, and all building equipment requiring flexible connections shall have a green grounding conductor properly connected to the frames and extending continuously inside conduit with circuit conductors to the supply source bus with accepted connectors regardless of conduit size or type. This shall include food service equipment, laundry equipment, and all other "Equipment By Owner" to which an electric conduit is provided under this Division.

3.05 MAIN ELECTRICAL SERVICE

A. Existing Buildings:
   1. The electrical contractor shall verify that each building's electrical service is properly grounded as required by the NEC.
   2. Provide and install electrical service grounding at each building as called for herein for all existing services that do not comply with the grounding specified above.
   3. Supplement existing electrical service grounding at each building as required to comply with all requirements in these specifications.
   4. If exterior ground rod electrode does not exist at each buildings main electrical service, provide and install these ground rods as called for main electrical service, exterior of building.

B. Complete installation shall meet and exceed the requirements of the NEC 250.

C. Artificial electrodes shall be provided for the main service in sufficient number and configuration to secure resistance specified.

D. Bond To All Of The Following When Available On Site:
   1. Ground Rods.
   2. Metal Water Pipe (Interior and Exterior to Building)
   3. Building Metal Frame, Structural Steel and/or Reinforced Structural Concrete

4. All Piping Entering or Leaving All Buildings.
5. Provide a main ground, bare copper conductor, sized per applicable table in NEC 250, but in no case less than #2/0, shall be run in conduit from the main switchgear of each building to the building steel in each respective building. Reference NEC 250.104 (c). This ground conductor shall also be run individually from the main switchgear and be bonded to the main water service ahead of any union in pipe and must be metal pipe of length as acceptable by authorities having jurisdiction. Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe.

E. Ground/bond neutral per NEC 250.

F. Provide and install ground bus bar on wall near main service disconnect/switchboard. Connect to ground bar in disconnect/switchboard bonded to switchboard/disconnect enclosure/neutral with copper grounding conductor sized per applicable table in NEC 250.

3.06 TRANSFORMER GROUNDING

A. Ground all transformers and enclosures of 120/208V and 277/480V "separately derived systems" as specified herein.
1. Ground per NEC 250 and these specifications.
2. Bond neutral to transformer frame/enclosure and the equipment grounding conductors of the derived system with copper ground conductor sized per applicable table in NEC 250.
3. Connect transformer neutral/ground to grounding electrode per NEC 250 with grounding electrode conductor sized per applicable table in NEC 250.
4. Where neither building steel nor water pipe grounding electrodes are available (i.e. exterior locations with no available water pipe electrode) provide two ground connections: each to two or more ten foot (10') ground rod electrodes at no less than 30 foot spacing, driven vertical to a minimum depth of ten foot plus one foot below grade.
5. Connect all transformers to main electrical service ground bar with a grounding electrode conductor per NEC 250. [UIHC REQUIRED]
6. Ground to water system service pipe as required by NEC 250.

B. Provide additional ground electrodes as required to achieve specified ground resistance.

C. Where two or more ground electrodes are used at any one required ground location, they shall be bonded together with a copper ground conductor, sized to meet applicable table in NEC 250, but in no case less than #2/0.

D. Complete installation shall exceed the minimum requirements of NEC 250.

E. Equipment ground conductors shall be provided in addition to above grounding. See 'EQUIPMENT GROUNDING CONDUCTOR'.

3.07 EXTERIOR GRADE MOUNTED EQUIPMENT

A. General:
1. All equipment (including chillers, pumps, disconnects, starters, control panels, panels, etc) mounted exterior to building shall have their enclosures grounded directly to a grounding electrode at the equipment location in addition to the building equipment ground connection.
2. Bond each equipment enclosure, metal rack support, mounting channels, etc. to ground electrode system at each rack with an insulated copper ground conductor sized to match the grounding electrode conductor required by applicable table in NEC 250 based on equipment feeder size, but in no case shall conductor be smaller than #6 copper or larger than #2 copper. This connection is in addition to grounding electrode connections required for services.

B. Main Electrical Service Rack Mounted Equipment:
1. Ground per "MAIN ELECTRICAL SERVICE".
2. Bond all metal parts as noted above.

C. Electrical Sub Service Rack Mounted Equipment:
1. Ground per "MAIN ELECTRICAL SERVICE", except do not bond neutral to ground.

2. Bond all metal parts as noted above.

D. Electrical Equipment Connection Rack Mounted Equipment: Bond all metal parts as noted above.

E. Grounding Electrodes (Ground Electrodes System) shall be located at each rack location.

F. Service Equipment: Ground electrode required per "MAIN ELECTRICAL SERVICE".

G. Equipment Connection: Two or more ten foot (10') ground rods at no less than 30 foot spacing, driven vertical to a minimum depth of one foot (1') below grade. Bond the two or more ground rods together with a size to meet applicable table in NEC 250, but no less than a #2 copper ground conductor. Provide additional rod electrodes as required to achieve specified ground resistance.

H. Complete installation shall exceed the minimum requirements of NEC 250 and, when applicable, NFPA 78.

3.08 LIGHT FIXTURES

A. All new and removed/reinstalled fixtures in building interior, and exterior fixtures shall be provided with green grounding conductor, solidly connected to unit. Individual fixture grounds shall be with lug to fixture body, generally located at point of electrical connection to the fixture unit.

B. All suspended fixtures and those supplied through flexible metallic conduit shall have green ground conductor from outlet box to fixture. Cord connected fixtures shall contain a separate green ground conductor.

C. Pole Light Fixtures:
   1. Metal Pole Light Fixtures:
      a. Freestanding pole mounted lighting fixtures shall each have a Class I or Class II lightning protection main copper down conductor connected to grounding electrodes at base of pole.
      b. Conductor shall be bonded to metal pole via UL Listed ground clamp suitable for use. Locate ground lug opposite to hand hole (or adjacent if visible through hand hole).
   2. Concrete or Non-Metallic Pole:
      a. Freestanding pole mounted lighting fixtures shall each have a Class I or Class II lightning protection main copper down conductor connected to grounding electrodes at base of pole.
      b. Conductor shall be extended from grounding electrode to top of pole and terminate at the top of pole in a Class I or Class II copper lightning protection air terminal.
      c. Each metal part of light fixture assembly, bracket, ballast cabinet, disconnect, transformer, etc. that is mounted to pole shall be bonded to down conductor.
   3. Grounding Electrodes:
      a. Two or more ten foot (10') ground rods at no less than ten foot (10') spacing shall be driven vertically to a minimum depth of ten foot' plus one foot below grade.
      b. Bond the two or more ground rod electrodes together with a Class I or Class II lightning protection main copper conductor.
      c. Provide additional rod electrodes as required to achieve specified ground resistance.
      d. The two or more grounding rod electrodes shall be installed at each light pole.

D. Installation shall exceed minimum requirements of NFPA 780.

3.09 MISCELLANEOUS GROUNDING CONNECTIONS

A. Provide bonding to meet regulatory requirements.

B. Required connections to building steel shall be with UL accepted non-reversible crimp type ground lugs exothermically welded to bus bar that is either exothermically welded or bolted to steel in locations where weld will affect the structural properties of the steel. Required connections to existing building structural steel purlins/i beams shall be with heavy duty bronze "C" clamp with two bolt vise-grip cable clamp.

C. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground; be installed in conduit; be bonded to conduit at both ends when conduit is metal; have connections accessible for inspection; and made with accepted solderless connectors brazed or bolted to the equipment or to be grounded; in NO case be a current carrying conductor; have a green jacket unless it is bare copper; be run in conduit with power and branch circuit conductors. The main grounding electrode conductor shall be exothermically welded to ground rods, water pipe, and building steel.

D. All surfaces to which grounding connections are made shall be thoroughly cleaned to maximum conductive condition immediately before connections are made thereto. Metal rust proofing shall be removed at grounding contact surfaces, for 0 ohms by digital Vm. Exposed bare metal at the termination point shall be painted.

E. All ground connections that are buried or in otherwise inaccessible locations, shall be welded exothermically. The weld shall provide a connection which shall not corrode or loosen and which shall be equal or larger in size than the conductors joined together. The connection shall have the same current carrying capacity as the largest conductor.

F. Install ground bushings on all metal conduits entering enclosures where the continuity of grounding is broken between the conduit and enclosure (i.e. metal conduit stub-up into a motor control center enclosure or at ground bus bar). Provide an appropriately sized bond jumper from the ground bushing to the respective equipment ground bus or ground bus bar.

G. Install ground bushings on all metal conduits where the continuity of grounding is broken between the conduit and the electrical distribution system (i.e. metal conduit stub-up from wall outlet box to ceiling space. Provide an appropriately sized bond jumper from the ground bushing to the respective equipment ground bus or ground bus bar.

H. Each feeder metallic conduit shall be bonded at all discontinuities, including at switchboards and all sub distribution and branch circuit panels with conductors in accordance with applicable table in NEC 250 for parallel return with respective interior grounding conductor.

I. Grounding provisions shall include double locknuts on all heavy wall conduits.

J. Bond all metal parts of pole light fixtures to ground rod at base.

K. Install grounding bus in all existing panelboards of remodeled areas, for connection of new grounding conductors, connected to an accepted ground point.

L. Bond together reinforcing steel and metal accessories in pool and fountain structures.

M. Where reinforced concrete is utilized for building grounding system, proper reinforced bonding shall be provided to secure low resistance to earth with "thermite" type devices, and #10AWG wire ties shall be provided to not less than ten full length rebars that contact the connected rebar.

3.10 GROUNDING BAR INSTALLATION

A. Where indicated on the drawings, provide and install grounding bar/ground bus (bus bar). These bus installations are intended to provide a low-impedance "Earthing" path for surge voltages, which are electrically "clamped" and shunted to earth by variable-impedance surge protective devices. Metal sheaths of underground cables are also to be grounded thereto at points of building entrance.

B. Mount bolt tapping lugs with hex head bolts to bus bar at two inch (2") on center spacing, one for each ground conductor.

C. Mount bus bar to wall using two inch (2") polyester molded insulator stand-off.

D. Extend a #2/0 (minimum size) or larger THWN insulated copper ground conductor (if larger size is called for on drawings or required by N.E.C. for service ground, etc.) in PVC conduit to accepted service ground installation or ground bus/bar in main service equipment enclosure.

E. Extend #6 insulated copper ground wire from respective bus/bar to each 'local' ground bus/bar in each cabinet for the data and sound systems (if applicable).

F. 'Systems' grounding bus/bar must be connected with #2/0 insulated copper conductor to grounding electrodes system as defined in NEC "Article 800-40(b).

G. A separate grounding bar shall be installed in telecommunication rooms. Connect to the main electrical grounding bar with a #4/0 AWG grounding conductor in conduit.

3.11 TESTING AND REPORTS

A. Raceway Continuity: Metallic raceway system as a component of the facilities ground system shall be tested for electrical continuity. Resistance to ground throughout the system shall not exceed specified limits.

B. Ground resistance measurements shall be made on each system utilized in the project. The ground resistance measurements shall include building structural steel, driven grounding system, water pipe grounding system and other accepted systems as may be applicable. Ground resistance measurements shall be made in normally dry weather, not less than 24 hours after rainfall, and with the ground under test isolated from other grounds and equipment. Resistances measured shall not exceed specified limits.

C. Upon completion of testing, the testing conditions and results shall be certified by the electrical contractor and submitted to the engineer.

3.12 INTERFACE WITH OTHER PRODUCTS

A. Interface with communications system installed under other specification sections.

3.13 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument with current certificate of calibration to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method or signal injection method.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Product requirements

B. Formed steel channel

C. Indoor housekeeping pads

D. Outdoor housekeeping pads

E. Sleeves

1.02 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association)

B. NFPA 70 - National Electrical Code

1.03 SUBMITTALS

A. Product Data: Provide manufacturers catalog data for fastening systems.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of products.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Materials and Finishes:
   1. Corrosion resistant.
   2. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Anchors and Fasteners:
   1. Concrete Structural Elements: Use expansion anchors and preset inserts.
   2. Steel Structural Elements: Use beam clamps and welded fasteners.
   3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
   4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
   5. Solid Masonry Walls: Use expansion anchors and preset inserts.
   6. Sheet Metal: Use sheet metal screws.
   7. Wood Elements: Use wood screws.

C. Staples:
   1. Wood Elements: UV resistant polyethylene saddles. For use with non-metallic sheathed cable only.

2.02 FORMED STEEL CHANNEL

A. Manufacturers:
   1. Globe Strut
   2. Uni-Strut
   3. Kindorf
   4. Power-Strut
   5. Erico
   6. Engineer approved equal.

B. Description: Galvanized steel.

C. Provide aluminum supports and hangers in pool area and pool equipment room.

2.03 INDOOR HOUSEKEEPING PADS

A. This contractor shall provide and install four inch (4") high concrete housekeeping pads under all floor-mounted equipment they have supplied and/or installed. The housekeeping pads shall extend a minimum of six inch (6") beyond the largest dimensions of the equipment mounted on the pad. The housekeeping pads shall have wire mesh embedded in the pad to reinforce the structure. All edges shall be rounded with a 1/2 inch radius.

2.04 OUTDOOR HOUSEKEEPING PADS

A. This contractor shall provide and install concrete pads under all electrical equipment installed outdoors. The pads shall be as detailed on the drawings unless indicated otherwise. This contractor shall install pads under all utility company supplied and installed transformers. The pad dimensions shall be detailed on the drawings unless indicated otherwise.

B. The pad dimensions and construction shall be in accordance to the utility company requirements.

2.05 SLEEVES

A. For conduits passing through wall, below grade, underground wall sleeves for conduits 4" or larger shall be continuous rigid steel. Seal with Linkseal, or engineer approved equal, at two diameters larger than conduit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions and utility company regulations where applicable.

B. Provide anchors, fasteners and supports in accordance with NECA "Standard of Installation".
   1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
   2. Do not use spring steel clips and clamps.
   3. Do not use powder-actuated anchors.
   4. Do not drill or cut structural members.

C. Fabricate supports from structural steel or formed steel members or steel channel. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

D. Install surface-mounted cabinets and panelboards with minimum of four anchors.

E. Use steel channel supports to stand cabinets and panelboards one inch (1") off wall in all wet and damp locations.

F. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

G. Reinforce outdoor concrete pads with 1/2 inch steel reinforcing bars on 12 inch centers or as shown on the drawings.

H. All pathways and hangers shall be independently hung.

I. All pathways shall be routed overhead unless otherwise noted or approved by engineer.

END OF SECTION 26 05 29

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit requirements

B. Conduit types

C. Box types

D. Surface metal raceway types

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated

C. ANSI C80.5 - Rigid Aluminum Conduit

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies

E. ANSI/NFPA 70 - National Electrical Code

F. NEMA 250 - Enclosures for Electric Equipment

G. NEMA WD 6 - Wiring Device Configurations

H. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

I. NECA (National Electrical Contractor's Association) Standard of Installation

J. NEMA WD 6 - Wiring Device Configurations

K. TIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces

L. NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2013 (ANSI/NEMA OS2)

M. UL 514C- Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions

1.03 RELATED SECTIONS

A. Specification Section 27 0526 - Grounding and Bonding for Communications Systems

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than two inches.

B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 SUBMITTALS

A. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to the site.

B. Accept products on site. Inspect for damage.

C. Protect products from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as shown on the drawings.

B. Verify routing and termination locations of conduit prior to rough in.

C. Conduit routing is shown on the drawings in approximate locations unless dimensioned. Route as required completing the wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 1/2 inch for power wiring and 1 inch for low voltage wiring unless noted otherwise.

B. Size conduit per ANSI/NFPA 70.

C. Underground Installations:
   1. Within Five Feet (5') from Foundation Wall Including Below Building Slab: Use rigid steel conduit or schedule [40] [80] PVC conduit.
   2. More Than Five Feet (5') from Foundation Wall: Use rigid steel conduit or schedule [80] PVC conduit.
   3. Where PVC conduit is utilized below slab, provide transition from PVC to rigid steel prior to elbow up and then as continuous rigid conduit through slab. No PVC conduits shall penetrate vertically through concrete slab.
   4. Minimum Size: One inch.
   5. Provide warning tape.

D. Above Grade Outdoor Locations: Use rigid steel and aluminum conduit. Aluminum conduit shall not contact concrete mortar or block.

E. Above Grade In or Under Slab:
   1. Use rigid steel conduit or schedule [40] [80] PVC conduit.
   2. Maximum Size Conduit in Slab: Total of 50% of pour depth.
   3. Minimum Size: One inch.
   4. Where PVC conduit is utilized below slab, provide transition from PVC to rigid steel prior to elbow up and then as continuous rigid conduit through slab. No PVC conduits shall penetrate vertically through concrete slab. Unless PVC conduit is stalled below bottom-fed ground mounted equipment. PVC conduits may penetrate the slab as long as a box-out is provided in the slab to allow for conduit to pass through. Backfill box-out with pea gravel once conduits have been installed.

F. Wet and Damp Locations:
   1. Use rigid steel conduit and intermediate metal conduit.
   2. Wiring methods for pool and pool equipment rooms as defined in NEC 680.14 shall be listed and identified for use in such areas. Use rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit, or reinforced thermosetting resin conduit in these areas where subject to a corrosive environment.

G. Dry Locations:
   1. Concealed: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing.
   2. Exposed: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing.

2.02 CONDUIT TYPES

A. Metal Conduit:
   1. Rigid Steel Conduit: ANSI C80.1
   2. Rigid Aluminum Conduit: ANSI C80.5
   3. Intermediate Metal Conduit (IMC): Rigid steel
   4. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

B. Flexible Metal Conduit:
   1. Description: Interlocked steel construction.
   2. Fittings: ANSI/NEMA FB 1.

C. Liquidtight Flexible Metal Conduit:
   1. Description: Interlocked steel construction with PVC jacket.
   2. Fittings: ANSI/NEMA FB 1.

D. Electrical Polyvinyl Chloride (PVC):
   1. Description: Synthetic Thermoplastic
   2. Fittings: NEMA TC3/UL 651
   3. Joints: ASTM D2855 solvent weld with ASTM D2564 solvent cement.

E. Electrical Metallic Tubing (EMT):
   1. Description: ANSI C80.3; galvanized tubing.
   2. Fittings and Conduit Bodies: ANSI/NEMA FB 1; [steel compression type with steel lock nut, and ring or] steel setscrew fittings.
   3. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type with steel lock nut, and ring. Steel setscrew fittings are NOT permitted. [UIHC REQUIRED]

F. PVC-Coated Rigid Steel Conduit
   1. Manufacturers
      a. Atkore - Calbond
      b. Plasti-bond
      c. Kor-Kap
      d. Engineer Approved equal
   2. PVC-Coated Conduit shall be listed to UL 6 and manufactured in accordance with ANSI C80.1 and NEMA RN-1.
   3. PVC-Coated Conduit shall be hot-dip galvanized covered by a zinc coating on the inside and outside surfaces in trade sizes ½ inch to 6 inches.
   4. Exterior PVC Coating Thickness: Nominal value of 40 mils (0.040 inch)
   5. Interior Urethane Coating Thickness: Nominal value of 2 mils (0.002 inch)
   6. Pass adhesion test and be labeled ETL Verified PVC-001
   7. Conduit shall be threaded on both ends. Taper of conduit threads shall be ¾” per foot (1 in 16) per ANSI/ASME B.1.20.1.

G. Pre-manufactured Fixture Whips:
   1. Manufacturers:
      a. Southwire
      b. EPCO
      c. Engineer approved equal.
   2. Description: UL listed flexible conduit with conductors and die-cast screw connectors on the end.
   3. Size: no longer than 6', 3/8" diameter.
   4. Wire: 14 AWG minimum for lighting and required by the load.
   5. Install between junction box and light fixture only in concealed and unfinished spaces. Use interior raceway or surface raceway where exposed in finished spaces.

H. Fittings and Conduit Bodies:
   1. NEMA TC 3
   2. Install offsets at surface boxes.
   3. Install single hole strap connectors on all exposed conduit one inch (1") and smaller.

2.03 BOX TYPES

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 a low voltage partition divider plate for applications where low voltage and line voltage circuits share the same outlet box.

B. Outlet Boxes:
   1. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel. Minimum of 4 x 4 square with depth of 2-1/8 inch
      a. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Include 1/2 inch male fixture studs where required.
      b. Concrete Ceiling Boxes: Concrete Type.
   2. Sheet Metal Communications Boxes: ANSI/NEMA OS 1, galvanized steel. Minimum of 4-11/16 inch square with a depth of 2-1/8 inch.
      a. Refer to the drawings for plaster ring size/opening.
   3. PVC Molded Construction box: 2 hour fire rating. Captive nails and bracket support. For use with non-metallic sheathed cable. May be used in wood construction on multi-family residential new construction projects only. UL listed.
      a. Use nonmetallic boxes when exposed rigid PVC conduit is used.
      b. Nonmetallic Boxes: Comply with NEMA OS 2; and list and label as complying with UL 514C.

C. Cast Boxes: NEMA FB 1, type #FD, cast alloy. Provide gasket cover by box manufacturer.

D. Floor Boxes:
   1. ANSI/NEMA OS 1, semi-adjustable.
   2. Material: Formed steel.
   3. Shape: Rectangular.
   4. Conform to regulatory requirements to concrete tight floor boxes.

E. Pull and Junction Boxes:
   1. Sheet Metal Boxes: NEMA OS 1 galvanized steel.
   2. Surface Mounted Cast Metal Box: NEMA 250, type #4 and #6, flat-flanged, surface mounted junction box:
      a. Material: Galvanized cast iron.
   3. Cover: Furnish with ground flange, neoprene gasket and stainless steel cover screws.
   4. Fiberglass Hand Holes:
      a. Die molded fiberglass hand holes.
      b. Cable Entrance: Precut 6" x 6" cable entrance at center bottom of each side.
      c. Cover: Fiberglass weatherproof cover with nonskid finish and light traffic rating.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Arrange supports to prevent misalignment during wiring installation.

C. Support conduit using coated steel, malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related conduit support using conduit rack. Construct rack using steel channel and provide space on each for 25% additional conduits.

E. Fasten conduit supports to building structure and surfaces.

F. Do not support conduit with perforated pipe straps. Remove wire used for temporary supports.

G. Do not use spring steel clips and clamps for support.

H. Install compression type fittings in all wet and damp areas.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings, parallel and perpendicular to walls.

M. Route the conduit in and under slab from point-to-point.

N. Do not cross conduits in slab.

O. Maintain adequate clearance between conduit and piping.

P. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degree F.

Q. Cut conduit square using saw or pipe cutter; de-burr cut ends.

R. Bring conduit to shoulder of fittings; fasten securely.

S. Use conduit hubs to fasten conduit to cast boxes.

T. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360 degrees), including those bends located immediately at the outlet or body. Use conduit bodies to make sharp changes in direction (as around beams). Use hydraulic one-shot bender to fabricate bends in metal conduit larger than two inch (2") size. All conduit shall be held right to structure.

U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

W. Provide suitable pull string in each empty conduit except sleeves and nipples.

X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Y. Ground and bond all conduits.

Z. Identify conduit.

AA. Use flexible and liquidtight conduits where required by NEC.

AB. Flexible conduit up to six feet (6') in length can be used to connect mechanical equipment with motors, compressors, light fixtures or unless directed by engineer.

AC. Install insulated bushings on all conduits and sleeves serving low voltage wiring prior to pulling wire unless otherwise noted.

AD. Install grounded insulated bushings on all conduits and sleeves serving data wiring prior to pulling wire unless otherwise noted.

AE. All low voltage conduits shall be sized to have less than 40% fill. Each penetration through a surface of any kind shall have a conduit sleeve with insulated bushings.

AF. Junction boxes shall not be installed over four foot (4') above accessible ceiling without prior written approval by owner.

AG. Conduits which enter communications entrance facilities shall extend 4 inches above the finished floor or 3 inches through the wall.

AH. Minimum bend radius for communications conduits:
   1. For conduits 2" or less, maintain a minimum bend radius of (6) times the actual inside diameter of the conduit.
   2. For conduits greater than 2", maintain a minimum bend radius of (10) times the actual inside diameter of the conduit.

AI. Communications conduits shall have no more than two (2) 90 degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.

1. A third bend is acceptable if:
    a. The total run is not longer than (33) feet.
    b. The conduit size is increased to the next trade size.

AJ. No continuous section of conduit may exceed 100 feet. Utilize pull boxes as necessary. Refer to the pull box execution section for more information.

AK. All wiring in the same conduit shall be from the same source and have the same voltage except where approved by the owner.

AL. Exterior rooftop pathways shall be supported above roofing membrane utilizing rubber type support bases with 12 ga. galvanized channel supports (Copper B-Line Dura-Block or equivalent). Install minimum 7/8" or compliant with current NEC requirements.

AM. For conduit installed in precast concrete walls or floors, it shall be acceptable to utilize Schedule 40 PVC conduit in lieu of EMT.

AN. PVC Coated Rigid Steel Conduit shall be installed in compliance with the latest version of the National Electrical Code and other applicable codes and standards as indicated elsewhere in these specifications.

AO. PVC Coated Rigid Steel Conduit shall be installed in accordance with NECA National Electrical Installation Standard (NEIS) 101, Standard for Installing Steel Conduits.

3.02 BOX INSTALLATION

A. Install boxes in accordance with NECA "Standard of Installation."

B. Install electrical boxes in locations as shown on the drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Set wall mounted boxes at elevations to accommodate mounting heights as indicated.

D. Electrical boxes are shown on the drawings in approximate locations unless dimensioned. Adjust box location up to ten foot (10') if required to accommodate intended purpose. Verify with architectural drawings and elevations for additional information.

E. Orient boxes to accommodate wiring device orientation.

F. Maintain headroom and present neat mechanical appearance.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Junction boxes shall not be installed over four foot (4’) above accessible ceilings.

H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than six inches (6") from ceiling access panel or from removable recessed luminaire.

I. Fire-stop boxes to preserve fire resistance rating of partitions and other elements. Boxes may be installed within a minimum of 24 inch separation with written approval prior to installation.

J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and back splashes.

K. Locate outlet boxes to allow luminaires positioned as shown on the drawings. If light fixture locations conflict with ceiling plans, the electrical contractor shall document discrepancies and send to the engineer for clarification.

L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

M. Use flush mounting outlet box in finished areas.

N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

O. Do not install flush mounting box back-to-back in wall, provide minimum six inch (6") separation.

P. Provide minimum 24 inch separation for receptacles in acoustic rated walls. Provide sound blocking putty where lighting control devices are located in the same stud cavity.

Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

S. Use adjustable steel channel fasteners for hung ceiling outlet box.

T. Do not fasten boxes to ceiling support wires.

U. Support boxes independently of conduit.

V. Use gang box where more than one device is mounted together. Do not use sectional box.

W. Use gang box with plaster ring for single device outlets.

X. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Y. Use cast iron floor boxes for installation in slab on-grade, formed steel boxes are acceptable for other installations unless otherwise noted.

Z. Set floor boxes level.

AA. Large Pull Boxes: Use set screw enclosure in interior dry locations, surface-mounted cast metal box in other locations.

AB. Use stamped steel bridges to fasten flush mounting outlet box between studs.

AC. Group devices associated with each other eight inches (8") on center (i.e. receptacle, data, voice outlet).

AD. All floor mounted device locations shall have a dimensioned drawing from the Architect prior to installation.

3.03 PULLBOXES

A. Size communications cabling pull boxes according to the following:

Conduit Trade Size	Width	Length	Depth	Width Increase for Additional Conduit
1"	4"	16"	3"	2"
1-1/4"	6"	20"	3"	3"
1-1/2"	8"	28"	4"	4"
2"	8"	36"	4"	5"
2-1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
4"	16"	60"	8"	6"

B. Directional changes within a pullbox shall not be allowed. Conduit entering the box shall have conduit leaving the box from the opposite side. Do not use a pull box to make 90 degree turns.

C. Install pullboxes in conveniently accessible locations.

D. Where identified on drawings as lockable, key all pullboxes the same.

E. Label all pull boxes. Handwritten labels shall not be accepted.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Install conduit using materials and method to preserve fire resistance rating of partitions and other elements.

B. Piping and Ductwork: Route conduits through roof openings or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified.

C. Coordinate installation of outlet and junction boxes for equipment connection.

3.05 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

C. Adjust floor box flush with finish flooring material.

3.06 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 33

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels

B. Wire markers

C. Conduit markers

D. Underground warning tape

E. Tracer wires

F. Identification

1.02 REFERENCES

A. NFPA 70 - National Electrical Code

B. NFPA 70E - Standard for Electrical Safety in the Workplace

1.03 SUBMITTALS

A. Product Data: Provide catalog data for nameplates, labels and markers.

B. Samples: Submit two nameplates 4" x 4" in size illustrating materials and engraving quality.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates:
   1. Normal power: Engraved three-layer laminated plastic white letters on black background.

B. Locations:
   1. All electrical distribution and control equipment enclosure.
      a. Switchboards and Panelboards: Line 1 shall state "Panel Name"; Line 2 shall state "Fed by Panel Name" as required by NEC section 408.4(B).
   2. Communication cabinets.
   3. Single mounted breaker.
   4. Transfer switch.
   5. Transformer.
   6. Fire alarm devices.

C. Letter Size:
   1. Use 1/8 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.
   3. Use 1/4 inch letters for identifying communications cabinets, transfer switches and transformers.

D. Labels: Embossed adhesive tape with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and communication outlets.

2.02 WIRE MARKERS

A. Description: Tape feeders to indicate phases.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
   2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams.

2.03 CONDUIT MARKERS

A. Location: Mark conduit longer than 20 feet.

B. Spacing: 30 feet on center.

C. Color:
   1. 208 Volt System: Black
   2. Fire Alarm System: Red
   3. Other Systems: Green

D. Legend:
   1. 208 Volt System: L- (name of feeder)
   2. Fire Alarm System: FA
   3. Telephone System: TS
   4. Computer System: CS

2.04 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. Seaton
   2. Engineer approved equal.

B. Description: Plastic four inch (4") wide tape, detectable type, colored RED with suitable warning legend describing buried electrical lines and inscribed "CAUTION - ELECTRIC LINE BURIED BELOW".

C. Location: Along length of each underground conduit.

2.05 TRACER WIRES

A. The electrical contractor shall provide a solid #10 AWG Tracer wire in each below grade conduit serving the electrical and communication systems. Tracer wires shall be labeled at each location of accessibility.

2.06 IDENTIFICATION

A. Identify All Junction Boxes With Appropriate Marker As Follows:
   1. 480 Volt System: Orange (circuit name and number)
   2. 208 Volt System: Black (circuit name and number)
   3. Fire Alarm System: Red

B. Write the circuit number of each device inside the device box (not ON the device cover). All receptacles and light switches (new and existing) shall have the final circuit number installed on each device cover with a nylon label. Coordinate exact requirements with the owner prior to installation.

C. If receptacle is not a standard 20A device, write the NEMA plug class on the circuit label.

D. Temporary label all outlets and switches with circuit numbers.

E. All receptacles capable of being powered by an emergency generator shall be identified with a red sticker 3/8 inch diameter with an adhesive back.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify conduit using field painting.

E. Paint [colored band on] each conduit longer than 6 feet.

F. Paint bands 20 foot on center.

G. Identify underground conduits or wiring using one underground warning tape per trench at three inch (3") below finished grade.

END OF SECTION 26 05 53

SECTION 26 09 43
DIGITAL LIGHTING CONTROL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Digital wall control
B. Digital occupancy/vacancy sensors
C. Digital room controllers
D. Low voltage cables
E. Wall face plates

1.02 RELATED SECTIONS

A. Specification Section 26 0533 - Raceway and Boxes for Electrical Systems
B. Specification Section 26 2726 - Wiring Devices
C. Specification Section 26 5100 - Interior Lighting
D. Specification Section 26 5600 - Exterior Lighting
E. Specification Section 27 4100 - Audio-Visual Systems

1.03 REFERENCES

A. NECA - Standard of Installation
B. NEMA WD 1 - General Requirements for Wiring Devices
C. NEMA WD 6 - Dimensional Requirements for Wiring Devices
D. NFPA 70 - National Electrical Code
E. UL 916 - Energy Management Equipment
F. UL 924 - Standard for Emergency Lighting and Power Equipment

1.04 SUBMITTALS

A. Product Data: Provide catalog data for nameplates, installation instructions, labels and markers, ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
C. Shop Drawings:
    1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
    2. Show exact location of all digital devices, including at minimum sensors, load controllers, and switches for each area on reflected ceiling plans.
    3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies and proof that the sensor is suitable for the proposed application.
    4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.
    5. Product information sheets for all components and wiring provided. Include standard options for each product and color offerings.
    6. Submit manufacturer sensor coverage patterns applicable to this project. For areas requiring multiple sensor devices for appropriate coverage, submit specific manufacturer approved sensor layout as an overlay directly on the project drawings
D. Closeout Submittals:

1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
2. Operation and Maintenance Manual:
    a. Include approved Shop Drawings and Product Data.
    b. Include Sequence of Operation, identifying operation for each room or space.
    c. Include manufacturer's maintenance information.
    d. Operation and Maintenance Data: Include detailed information on device programming and setup.
    e. Include startup and test reports.
3. Provide list of Extra Materials for owner to verify and sign for acknowledgement of receiving

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years' experience.

B. All room control devices and panels shall be provided with a five-year limited manufacturer's warranty, including one for one device replacement.

1.06 REGULATORY REQUIREMENTS

A. Digital Lighting Management System shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.

B. Conform to requirements of NFPA 70.

C. Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

D. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.

1.07 APPROVED MANUFACTURERS

A. All equipment specified in this specification shall be manufactured by one of the below listed companies unless specified elsewhere. Model numbers stated in this specification are for basis of design information only.
    1. Digital Lighting Control Systems:
        a. Hubbell Control Solutions - NX Series (Basis of Design)
        b. Lutron
        c. Acuity Brands
        d. Leviton
        e. Wattstopper
        f. Avi-On
        g. Engineer approved equals.

1.08 SYSTEM TYPE

A. System shall be wired.

PART 2 PRODUCTS

2.01 DIGITAL WALL CONTROL

A. Refer to the lighting sequence of operations or schedule on the drawings for additional requirements.

B. Low voltage momentary, self-configuring, digitally addressable pushbutton on/off, and scene selection.
    1. Basis of Design: Current NX Series - Smart Switch
    2. Description: Fully addressable pushbutton switch with LED status indicators, up to 6 button configuration with on/off, raise/lower and dimming functionality in a single gang. Decorator style design.

3. Part of a digital lighting control system and can control any load(s) connected to room controller.
4. Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa. Scene patterns may be saved to any button. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
5. Device shall have removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement shall be completed without removing the switch from the wall.
6. All digital parameter data programmed into an individual wall control shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

2.02 DIGITAL OCCUPANCY/VACANCY SENSORS

A. Refer to the lighting sequence of operations or schedule on the drawings for additional requirements.

B. Self-configuring, digitally addressable, calibrated wall or ceiling mounted; passive infrared (PIR), ultrasonic or dual technology.
1. Sensors shall be able to be digitally calibrated in the field with the ability to adjust the sensitivity and time delay.
2. Sensor shall be programmed to control specific loads within a local network. Devices shall be able to be assigned to a specific load within the room without wiring or special tools.
3. Sensor shall have adjustable re-trigger time for all manual-on loads.
4. All parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.
5. Wire all per manufacturer's recommendations.
6. Wire multiple sensors serving the same area to operate as a single unit.
7. Provide and install room controllers as required to obtain switching pattern shown on the drawings.
8. Sensors shall have a time delay that is can be adjusted from 5 to 30 minutes, set in field.
9. Provide with optional relay (N/O + N/C contacts, SPDT, 500 mA rated @ 24VDC) for mechanical integration and local HVAC control.

2.03 DIGITAL ROOM CONTROLLERS

A. Digital controllers for lighting zones and fixtures that automatically bind room loads to the connected control devices in the space without commissioning or the use of any tools. Provide controllers to match the room lighting and plug load control requirements.

B. Devices shall automatically configure the room to the most energy-efficient sequence of operation based upon the devices in the room.

C. Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off or selected dimming control.
1. Basis of Design: Current Control Solutions - NX Room Controller
2. Controller shall match the room lighting sequence and control type requirements.
3. Dual voltage (120/277 VAC, 60 Hz) capable rated for 20A total load
4. Wire per manufacturer's recommendations.
5. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power: Turn on to 100 percent, turn off, turn on to last level.
6. Dimming room controllers shall have options for 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
7. Devices shall have a minimum of two RJ-45 local network ports.
8. All parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

9. Room controller shall be capable of being programmed through Bluetooth technology via a free app and via a local area connection.

2.04 LOW VOLTAGE CABLES

A. Field-Terminated
   1. Digital room devices shall connect to the local network using field-terminated cables, which provide both data and power to room devices.
   2. Cable shall be plenum rated Cat 5e with RJ-45 connectors. Maximum cable run, and cable ratings shall meet manufacturer's requirements.
   3. Each field-terminated cable shall be tested following installation and testing results submitted to the Manufacturer's Representative for approval prior to proceeding with the work.
   4. Low voltage wiring topology must comply with manufacturer's specifications.
   5. Installing contractor shall meet all qualifications discussed in section 27 1005 -Telecommunications Cabling Infrastructure.

2.05 WALL FACE PLATES PROVIDED BY ELECTRICAL CONTRACTOR

A. Cover Plate:
   1. Basis of Design: Pass & Seymour #SS (Metal), to be confirmed by architect.
   2. Provide cover plate for all devices and provide multiple gang plates where required.

B. Jumbo Cover Plate:
   1. Basis of Design: Pass & Seymour #SSO (Metal) to be confirmed by architect.
   2. Provide cover plate for all devices and provide multiple gang plates where required.
   3. Provide jumbo plates on masonry rough-in. Verify with architect prior to work being performed.

PART 3 EXECUTION

3.01 SAMPLES

A. Upon request, electrical contractor is to provide a sample of any device specified in any available color.

3.02 COLOR

A. All colors of devices, flanges, and faceplates shall be determined during the submittal process by the Architect. In the electrical bid, include any allowances needed to allow for selection of all cataloged colors.

3.03 EXAMINATION

A. Verify that boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.04 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.05 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Low voltage wiring topology must comply with manufacturer's specifications

D. All line voltage connections shall be tagged to indicate circuit and switched legs.

E. Install wall plates on switches in finished areas.

F. Test all devices to ensure proper communication.

G. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.

H. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.

I. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.

J. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

K. Digital controllers for lighting and plug loads shall automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements.

L. Devices shall have status notification that indicates: data transmission, device power, load status and configuration status.

M. Each load shall be capable of the following behavior on power up following the loss of normal power: turn on to 100%, turn off, turn on to last level.

N. All devices installed above ceilings shall be UL 2043 plenum rated.

O. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

P. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.

Q. Provide a dry contact closure relay in indicated rooms to signal building automation system if room/zone is in "occupied" or "vacant" mode.

R. Network signal integrity on low-voltage cables require that each conductor and ground wire be correctly terminated at every connected device.

S. All low voltage cabling routed exposed in common and public areas shall be installed in EMT conduit. Coordinate final conduit routings with the Architect in the field during installation. Conduit installation shall meet all requirements listed in Section 26 0533 - Raceway and Boxes for Electrical Systems.

3.06 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Specification Section 26 0533 - Raceway and Boxes for Electrical Systems to obtain mounting heights indicated on the drawings. Before roughing in any floor devices the electrical contractor shall obtain a dimensioned drawing signed by the owner showing device locations.

B. Coordinate the placement of lighting control devices with millwork, furniture, equipment, door swings, etc. installed by others. Notify engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

C. Coordinate requirements of A/V devices and shades that interface with lighting control system. Provide all required relays and connections required if they are controlled by the lighting control system.

3.07 OVERSIGHT AND COMMISSIONING

A. At the start of construction, the contractor shall be responsible for organizing a pre-construction lighting controls meeting with contractor, manufacturer representative, owner, design team. The manufacturer rep shall provide samples of all products for review at this meeting.

B. Supplier to verify layout of occupancy sensor devices during submittal process and all suggestions are to be brought to the engineer's attention immediately. After manufacturer's

layouts have been approved, it shall be there responsibility of the manufacturer to ensure that the system operates per lighting control sequence as detailed on construction documents.

C. Supplier is to give instructions to the electrical contractor for installation locations. Locations, shown on the drawings, are intended to provide device count for bidding. All placement must be per manufacturer's recommendations.

D. Electrical contractor to install devices per manufacturer's layout. It shall be the responsibility of the contractor to verify that all quantities and device types are appropriate for space.

E. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.

F. Supplier is to visit site, calibrate, and verify that the control of each space complies with the Sequence of Operation at substantial completion of building. Coordinate this meeting with project engineer.

G. Supplier is to visit site and confirm proper operation of all automatic occupancy devices one month after owner occupancy. Supplier shall make modifications and calibrations as needed.

H. Manufacturer shall provide the owner with one working configuration tool (device or app) with instructions on how to wireless facilitate customization of devices post occupancy.

3.08 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

3.09 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.10 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

3.11 EXTRA MATERIALS AND LABOR:

A. The electrical contractor shall include in their bid an allowance to install an additional five wall control devices, five ceiling control devices, two room controllers, and two UL924 emergency lighting control devices including an average 50 feet of raceway, associated wiring, back box and labor, and all accessories required to energize each device requested. Device(s) may be added anytime during the construction process as requested by the owner or design team. Any unused devices shall be turned over to the owner at the final acceptance of building.

3.12 CLOSEOUT ACTIVITIES

A. Training Visit
   1. Lighting Control System Manufacturer shall provide (4) 2-hour training sessions on-site for personnel. At 3 months, 6 months, and 1 year from occupancy. The lighting controls representative shall schedule a 2 hour meeting with the owner to review system performance and make system adjustments if needed.

B. On-site Walkthrough
   1. Lighting Control System Manufacturer shall provide a factory certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.

C. Owner Occupancy
   1. After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Owner of post start-up activity.

2. Contractor shall be responsible for resetting self-learning devices that are designed to adapt to the normal use of the area of control. This should happen once the owner has full occupied the space and the areas are under normal occupancy.

END OF SECTION 26 09 43

SECTION 26 22 00
TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Buck-Boost Transformers

1.02 RELATED SECTIONS

A. Specification Section 26 0526 - Grounding and Bonding for Electrical Systems

B. Specification Section 26 0533 - Raceway and Boxes for Electrical Systems

C. Specification Section 26 2416 - Panelboards

1.03 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011

B. NEMA ST20 - Dry Type Transformers for General Applications

C. UL 1561 - Dry-Type General Purpose and Power Transformers

D. NEMA TP1 - Guide for Determining Energy Efficiency for Distribution Transformers

E. NEMA TP2 - Standard Test Method for Measuring Energy Consumption of Distribution Transformers

F. NEMA Premium Low Voltage Transformer Program

1.04 SUBMITTALS

A. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

B. Suppliers asking consideration, as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified, and shall be received by the consultant engineer no less than 10 days prior to the bid due date for consideration.

C. Test Reports: Indicate loss data, efficiency at 25%, 50%, 75% and 100% rated load, and sound level.

D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Record actual locations of transformers in project record documents.

1.05 STANDARDS

A. Transformers 750kVA and smaller shall be listed by Underwriters Laboratories.

B. Conform to the requirements of ANSI/NFPA 70.

C. Transformers are to be manufactured and tested in accordance with NEMA ST20.

D. Transformers losses shall conform to NEMA TP1 requirements

E. Transformers losses shall be tested in accord with NEMA TP2 procedures.

PART 2 PRODUCTS

2.01 BUCK-BOOST TRANSFORMERS

A. Manufacturers:
   1. Square D
   2. General Electric
   3. Cutler-Hammer
   4. Engineer approved equal.

B. Suppliers asking consideration, as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified, and shall be received by the consultant engineer no less than 10 days prior to the bid due date for consideration.

C. Description: NEMA ST 1, factory-assembled, dry type two winding buck and boost transformers, ratings as indicated.

D. Insulation System and Average Winding Temperature Rise for Rated kVa As Follows:
   1. 0.25-2 kVA: Class 185 with 80 deg C rise.
   2. 3-7.5 kVA: Class 220 with 115 deg C rise.

E. Primary Voltage: 120 x 240 volt, single phase.

F. Secondary Voltage: As needed to achieve desired voltage.

G. Mounting: Wall.

H. Coil Conductors: Continuous windings.

I. Lugs: Suitable for terminating conductors sized for full load ampacity of transformer unit when operating in buck-and-boost configuration shown.

J. Enclosure: NEMA ST 1, type #1.

K. Isolate core and coil from enclosure using vibration-absorbing mounts.

L. Nameplate: Include transformer connection data.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set transformer plumb and level, use flexible conduit, under the provisions of Specification Section 26 0533 - Raceway and Boxes for Electrical Systems. Minimum two foot (2') length for connections to transformer case. Make conduit connections to side panel of enclosure.

B. Mount wall mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.

C. Mount trapeze-mounted transformers as indicated.

D. Use accessory brackets or integral flanges for all wall-mounted units.

E. Provide seismic restraints.

F. All conduit connections shall be flexible type conduit due to vibration isolation. Rigid type conduit is not acceptable.

G. Provide grounding and bonding in accordance with Specification Section 26 0526 - Grounding and Bonding for Electrical Systems.

H. Verify Primary and Secondary Over Current Protection Devices are selectively coordinated for legally required standby systems(s) per NEC 701.27.

3.02 FIELD QUALITY CONTROL

A. Inspect in accordance with NETA ATS, except Section 4.

B. Perform inspections listed in NETA ATS, Section 7.2.

3.03 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Check for damage and tighten connections prior to energizing transformer.

END OF SECTION 26 22 00

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Distribution panelboards

B. Branch circuit panelboards

1.02 RELATED SECTIONS

A. Specification Section 26 05 26 - Grounding and Bonding for Electrical System

B. Specification Section 26 05 53 - Identification for Electrical Systems

C. Specification Section 26 43 13 - Surge Protective Device

1.03 REFERENCES

A. NECA Standard of Installation (published by the National Electrical Contractors Association

B. NEMA AB1 - Molded Case Circuit Breakers

C. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies

D. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

E. NEMA PB 1 - Panelboards

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association)

H. NFPA 70 - National Electrical Code

1.04 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

B. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Record actual locations of panelboards and record actual circuiting arrangements in project record documents.

D. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

E. It is the electrical contractors and suppliers responsibility to confirm the appropriate size and quantity of circuit breakers in the submitted panelboards with the information shown on the plan sheets, including the panelboard schedule, and the mechanical contractor prior to releasing the panelboards for construction.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 RATINGS

A. Definitions:
   1. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified. The distribution panels, panelboards, and load centers for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

1.08 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 DISTRIBUTION PANELBOARDS

A. Manufacturers:
   1. Square D. I-Line
   2. General Electric
   3. Eaton (Cutler Hammer)
   4. Siemens
   5. Engineer approved equal.
   6. No engineer approved equal.

B. Description: NEMA PB1, circuit breaker type.

C. Service Conditions:
   1. Temperature: 40 deg F.
   2. Altitude: 1000 feet.

D. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

E. Minimum Integrated Short Circuit Rating: See schedule on the drawings.

F. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

G. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers with common trip handle for all poles, listed as type #SWD for lighting circuits, type #HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Provide arc fault circuit breakers in all dwelling units as required by NEC Code. Do not use tandem circuit breakers. Handle ties to make multiple pole breakers are NOT permitted.

H. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. Handle ties to make multiple pole breakers are NOT permitted.

I. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let through current and energy level less than permitted for same size Class RK-5 fuse. Handle ties to make multiple pole breakers are NOT permitted.

J. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

K. Enclosure: NEMA PB 1, type #1, cabinet box in accordance with code.

L. Cabinet Front: Surface type, fastened with concealed trim clamps. Finish in manufacturer's standard gray enamel. Concealed hinge. Flush lock all keyed alike.

M. Surge Protection Devices shall comply with Specification Section 26 4313 - Surge Protection Devices

N. Provide space for four future 200 amps, 3-phase circuit breakers unless more space is noted on the drawings.

O. If the system voltage is less than 150V and the equipment is neither grounded nor double insulated, a Class A GFCI with 4 to 6 mA trip current is required per the NEC. However, if the equipment is considered "specialty" or "special-purpose" and either grounded or double-insulated, a Class C GFCI with 20 mA trip level shall be acceptable.

2.02 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:
   1. Square D. #NQ or NF
   2. General Electric
   3. Eaton (Cutler-Hammer)
   4. Siemens
   5. Engineer approved equal.

B. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

D. Minimum Integrated Short Circuit Rating: See schedule on the drawings.

E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers with common trip handle for all poles, listed as type #SWD for lighting circuits, type #HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Provide arc fault circuit breakers in all dwelling units as required by NEC Code. Do NOT use tandem circuit breakers. Handle ties to make multiple pole breakers are NOT permitted.

F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let through current and energy level less than permitted for same size Class RK-5 fuse. Handle ties to make multiple pole breakers are NOT permitted.

G. Enclosure: NEMA PB 1, type #1.

H. Cabinet box is to be 6" D x 20" W for 240 volt and less panelboards.

I. Cabinet Front: Flush or surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

J. Door: Provide hinged door-in-door trim.

K. Surge Protection Devices shall comply with Specification Section 26 4313.

L. All panelboards 225 amp or less, are to have either intermediate supports on the bus bars to prevent deflection, or are required to have 800 amp/square inch bus bars if the bus bars are only supported at each end of the bus.

M. Each section of multi-section panels shall have the same dimensions.

N. If the system voltage is less than 150V and the equipment is neither grounded nor double insulated, a Class A GFCI with 4 to 6 mA trip current is required per the NEC. However, if the equipment is considered "specialty" or "special-purpose" and either grounded or double-insulated, a Class C GFCI with 20 mA trip level shall be acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1 and the NECA "Standard of Installation."

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

C. Height is to be six feet (6') to top of the panelboard. Install panelboards taller than six feet (6') with bottom no more than four inch (4") above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Use actual room numbers and not plan room numbers. Coordinate with owner. Revise directory to reflect circuiting changes required to balance phase loads. Typed circuit directories shall be completed in Microsoft Excel. The electrical contractor shall submit a CD with all directories included.

F. Provide engraved plastic nameplates under the provisions of Specification Section 26 05 53 - Identification for Electrical Systems.

G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling and to the floor below. Minimum spare conduits: Five empty one inch (1") at each recessed panel location. Identify each as SPARE.

H. Ground and bond the panelboard enclosure.

I. Any panel field modifications and associated means and methods shall be approved by the Authority Having Jurisdiction and the equipment manufacturer. Any costs associated shall be included in the bid.

J. It shall be the responsibility of the electrical contractor to verify all wire sizes with existing and new circuit breakers prior to ordering and installing so that specified wire will properly fit into the corresponding circuit breaker.

K. Verify lug size of electrical equipment and mechanical equipment is properly sized to receive specified conductor size. Refer to one-line and the conduit/conductor chart for additional information.

3.02 FIELD QUALITY CONTROL

A. Inspect in accordance with NETA ATS.

B. Perform inspections listed in NETA ATS.

3.03 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

SECTION 26 27 01
UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metering instrument transformer cabinets

B. Meter bases

C. Pre-fabricated pad for utility transformer

D. Concrete pad for utility transformer

E. Transformer install conduits and fittings

1.02 RELATED SECTIONS

A. Specification Section 26 13 00 - Distribution Switchgear

1.03 REFERENCES

A. NECA Standard of Installation National Electrical Contractors Association

B. NFPA 70 - National Electrical Code

C. OSHA (shoring/digging guidelines)

D. NESC (rules on proximity to other buried utilities)

1.04 SYSTEM DESCRIPTION

A. System Characteristics: 208Y/120 volts, thre] phase, four] wire, 60 Hertz.

1.05 SUBMITTALS

A. Product Data: Provide ratings and dimensions of Instrument Transformer Cabinets and meter bases.

B. Submit local utility company prepared drawings.

1.06 QUALITY ASSURANCE

A. Utility Company: MidAmerican Energy Company.

B. Perform work in accordance with local utility company's written requirements.

C. Obtain permission from utility company personnel before installation of any of the following: conduit, sweeps, metering equipment/cabinetry, equipment pads, forms for concrete pads

D. Maintain one copy of each document on site.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Review service entrance requirements and details with local utility company's representative.

1.09 FIELD MEASUREMENTS

A. if available verify that field measurements are as indicated on the utility company's (or AHJ as applicable) drawings.

B. Provide as builts of installation approved by utility, AHJ, or owner.

PART 2 PRODUCTS

2.01 METERING INSTRUMENT TRANSFORMER CABINETS

A. Description: Sheet metal cabinet with hinged door, conforming to utility company requirements with provisions for locking and sealing.

B. Size: As required by the local utility company.

2.02 METER BASES

A. The electrical contractor shall furnish meter base and meter socket with test switch in accordance with utility company requirements.

2.03 PREFABRICATED PAD FOR UTILITY TRANSFORMER

A. Description: Fiberglass reinforced plastic transformer pad sized as indicated on the drawings.

2.04 CONCRETE PAD FOR UTILITY TRANSFORMER

A. Description: Cast in place concrete pad with cable pit sized in accordance to utility requirements. Provide oil spill containment trench per utility company requirements. Refer to transformer pad detail for additional information.

B. EC shall furnish the following as applicable: rebar, gravel, backfill, sweeps, concrete, subgrade treatment, and/or other materials. Coordinate equipment requirements with local utility compayny.

2.05 TRANSFORMER INSTALL CONDUITS AND FITTINGS

A. Description: Provide conduit entrances to transformer pads, metering equipment, instrument transformers, and other distribution equipment. Provide all fittings and sweeps needed for installation. Extend conduits to location approved in writing by utility company. Coordinate number of conduits with utility company. Install conduit at greatest depth required by NESC or utility. Install pull strings as required by utility company.

PART 3 EXECUTION

3.01 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the project.

3.02 UTILITY FEES

A. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed by this contractor.

3.03 INSTALLATION

A. Install transformer pad, metering transformer cabinets, meter socket with test switch and meter base as required by utility company. Provide primary conductor conduit for utility company per their requirements. Verify with utility prior to bidding. Refer to electrical one-line diagram for additional information.

B. EC shall furnish the following as applicable: meter pedestal, meter socket, weatherhead, bypass, test switches, other meter mounting equipment, wall attachments, and/or standalone metering structure. Coordinate equipment requirements with utility company.

END OF SECTION 26 27 01

SECTION 26 27 16
ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hinged cover enclosures

B. Cabinets

C. Terminal blocks

D. Accessories

1.02 RELATED SECTIONS

A. Specification Section 26 05 29 - Hangers and Supports for Electrical Systems

B. Specification Section 26 27 26 - Wiring Devices

1.03 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association)

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

C. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems

D. NFPA 70 - National Electrical Code

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard data for enclosures and cabinets.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.05 MAINTENANCE MATERIALS

A. Furnish two of each key.

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250, type #1, #3R, #4 steel enclosure as noted on the drawings.

B. Covers: Continuous hinge held closed by flush latch operable by screwdriver.

C. Provide interior plywood panel for mounting terminal blocks and electrical components. Finish with white enamel.

D. Enclosure Finish: Manufacturer's standard enamel.

2.02 CABINETS

A. Boxes: Galvanized steel with removable end walls.

B. Backboard: Provide 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.

C. Fronts: Steel, surface type with door with concealed hinge, and flush lock. Finish with gray baked enamel.

D. Provide metal barriers to form separate compartment wiring of different systems and voltages.

E. Provide accessory feet for freestanding equipment.

2.03 TERMINAL BLOCKS

A. Terminal Blocks: NEMA ICS 4.

B. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors rated 600 volts.

C. Signal and Control Terminals: Modular construction type, suitable for channel mounting with tubular pressure screw connectors, rated 300 volts.

D. Provide ground bus terminal block with each connector bonded to enclosure.

2.04 ACCESSORIES

A. Plastic Raceway: Plastic channel with hinged or snaps on cover.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.

C. Install cabinet fronts plumb.

3.02 CLEANING

A. Clean electrical parts to remove conductive and harmful materials.

B. Remove dirt and debris from enclosure.

C. Clean finishes and touch up damage.

END OF SECTION 26 27 16

SECTION 26 27 17
EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cord and caps

1.02 RELATED SECTIONS

A. Specification Section 26 05 19 - Electrical Power Conductors and Cables

B. Specification Section 26 05 33 - Raceway and Boxes for Electrical Systems

1.03 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements

C. NFPA 70 - National Electrical Code

D. Product Data: Provide wiring device manufacturers catalog information showing dimensions, configurations, and construction.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 SUBMITTALS

A. Product Data: Provide catalog data for nameplates, labels and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.06 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams and manufacturer’s instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 CORDS AND CAPS

A. Provide and install, as required, for the installation of equipment for this project. Verify that equipment scheduled for others to provide or install requires installation of cord and caps prior to bidding.

B. Attachment Plug Construction: Conform to NEMA WD 1.

C. Configuration: NEMA WD 6, match receptacle configuration at outlet provided for equipment.

D. Cord Construction: ANSI/NFPA 70, type #SO multi-conductor flexible cord with identified equipment-grounding conductor, suitable for use in damp locations.

E. Size: Suitable for connected load of equipment, length of cord and rating of branch circuit over current protection.

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 liquid tight flexible conduit with watertight connectors in damp, wet, or sterile locations.

C. Make wiring connections using wire and cable with insulation suitable for temperature encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field supplied an attachment plug is indicated.

E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

F. Install disconnect switches, controllers, control stations, and control devices as indicated or required by code.

G. Provide interconnecting conduit and wiring between devices and equipment where indicated.

H. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor and ceilings.

END OF SECTION 26 27 17

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches
B. Duplex receptacles
C. Ground fault circuit interrupting receptacles
D. USB charge duplex receptacles
E. Simplex receptacles
F. Wall plates
G. Floor boxes and service fittings
H. Emergency pushbutton
I. General purpose contactor

1.02 RELATED REQUIREMENTS

A. Specification Section 26 0533 - Raceway and Boxes for Electrical Systems
B. Specification Section 26 0943 - Digital Lighting Control Systems

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2010
B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005)
C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R 2008)
D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
E. UL Standard 943 - Standard for Safety for Ground-Fault Circuit Interrupters (GFCIs)

1.04 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. Manufacturer's Installation Instructions.
    1. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
    2. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
D. 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 Wall Plates: One of each style, size, and finish.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Description:
   1. Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   2. Body and Handle: Impact-resistant plastic with toggle handle. Auto-grounding strap.
   3. Ratings: Match branch circuit and load characteristics. Default rating is 20A, 120/277V, 1HP.
   4. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
   5. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
   6. Color: Selected during submittal phase. Provide color chart upon request.

B. Types:
   1. Toggle Switches
      a. Approved Manufacturers and Models:
         1) Pass & Seymour #PS20AC
         2) Cooper #2221
         3) Hubbell #1221
         4) Leviton #1221-2
      b. Description: Single pole, double pole, 3-way, and 4-way toggle switches as indicated on plans.

2.02 DUPLEX RECEPTACLES

A. Description
   1. Style: Hard use specification grade
   2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
   3. Configuration: NEMA WD 6, type as specified and indicated.
   4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
   5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
   6. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
   7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
   8. Color: Selected during submittal phase. Provide color chart upon request.

B. Types
   1. Duplex Receptacles
      a. Manufacturers:
         1) Pass & Seymour #5362
         2) Cooper #5362C
         3) Hubbell #5362
         4) Leviton #5362-S
      b. Description: Traditional style, hard use specification grade duplex receptacle with wraparound grounding/mounting strap.
   2. Decorator Style Duplex Receptacles
      a. Manufacturers:
         1) Pass & Seymour #26532
         2) Cooper #6352
         3) Hubbell #DR20
         4) Leviton #16352
      b. Description: Decorator style, hard use specification grade duplex receptacle with wraparound grounding/mounting strap.
   3. Tamper-Resistant Duplex Receptacles
      a. Manufacturers:
         1) Pass & Seymour #TR5362

2) Cooper #TRSGF
3) Hubbell #HBL5362TR
4) Leviton #5362-SG

b. Description: UL listed tamper-resistant receptacle with thermoplastic shutters.
c. Receptacles in all areas as noted in NEC Article 406.

4. Tamper-Resistant Decorator Style Duplex Receptacles
   a. Manufacturers:
      1) Pass & Seymour #TR26362
      2) Cooper
      3) Hubbell
      4) Leviton
   b. Description: UL listed tamper-resistant, decorator style, hard use specification grade duplex receptacle with wraparound grounding/mounting strip.
   c. Receptacles in all areas as noted in NEC Article 406.
5. Weather-Resistant Receptacles
   a. Manufacturers:
      1) Pass & Seymour #2097TRWR
      2) Cooper #WRSGF20
      3) Hubbell #GFTWRST20
      4) Leviton #GFWT2
   b. Description: UL listed weather-resistant receptacle.
   c. Provide weather-resistant receptacles for all receptacles located in wet and damp locations as described in NEC Article 406.

2.03 GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLES

A. Receptacles: Complying with NEMA WD 6 and WD 1. Class A GFCI rated.
   1. Style: Hard use specification grade
   2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
   3. Configuration: NEMA WD 6, type as specified and indicated.
   4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
   5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
   6. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
   7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
   8. Color: Selected during submittal phase. Provide color chart upon request.

B. Types
   1. GFCI Duplex Receptacles
      a. Manufacturers:
         1) Pass & Seymour #2097
         2) Cooper SGF20
         3) Hubbell GFRST20
         4) Leviton GFNT2
      b. Description: Specification grade duplex GFCI receptacle.
      c. Receptacles noted as "GFI" on plans.
   2. GFCI Tamper Resistant Receptacles
      a. Manufacturers:
         1) Pass & Seymour 2097TR
         2) Cooper TRSGF20
         3) Hubbell GFTRST20
         4) Leviton GFTR2
      b. Description: Specification grade tamper-resistant duplex GFCI receptacle.
      c. Receptacles in all areas as noted in NEC Article 406.
      d. Receptacles noted as "GFI" on plans.

2.04 USB CHARGE DUPLEX RECEPTACLES

A. Receptacles: Complying with NEMA WD 6 and WD 1.
   1. Style: Hard use specification grade. Dual USB charging ports rated at a minimum of 3.5A.
   2. Device Body: Impact resistant plastic with impact resistant nylon face. Auto grounding strap.
   3. Ratings: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
   4. Wiring: Three (3) pre-stripped 6” wire leads for line, neutral, and ground. Splice to building wire within outlet box.
   5. Color: Selected during submittal phase. Provide color chart upon request.

B. USB Duplex Receptacle: Type A & C
   1. Manufacturers:
      a. Hubbell USB20
      b. Eaton
      c. Pass & Seymour
      d. Leviton
   2. Receptacles in all areas as noted in NEC Article 406.

2.05 SIMPLEX RECEPTACLES

A. Description
   1. Style: Hard use specification grade
   2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
   3. Configuration: NEMA WD 6, type as specified and indicated.
   4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
   5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
   6. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
   7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
   8. Color: Selected during submittal phase. Provide color chart upon request.

2.06 WALL PLATES

A. Standard Cover Plates:
   1. Type 302 stainless steel cover plates. Cover plate style to be confirmed during submittal phase.
   2. Basis of Design: Pass & Seymour #SS (Metal), to be confirmed during submittal phase.
   3. Provide coverplate for all devices and provide multiple gang plates where required.

B. Jumbo Cover Plates:
   1. Type 302 stainless steel oversize cover plates. Cover plate style to be confirmed during submittal phase.
   2. Basis of Design: Pass & Seymour #SSO (Metal) to be confirmed during submittal phase.
   3. Provide coverplate for all devices and provide multiple gang plates where required.
   4. Provide oversize plates on all masonry rough-ins. Verify with architect prior to work being performed.

C. Weatherproof Box & Cover:
   1. Basis of Design: Pass & Seymour #WIUC10.
      a. Description: Heavy-duty polycarbonate NEMA 3R “While-In-Use” weatherproof box and cover. Installed horizontally.
      b. Complies with NEC Article 406 requirements for wet location covers.
      c. Provide with plate kits as required.
      d. Provide multi-gang or deep cover configurations as required for application.
      e. Cover shall be capable of accepting a standard size padlock.
      f. Color shall be gray, to be confirmed during submittal phase.
      g. Indicated by "WP" on plans.

2.07 FLOOR BOXES AND SERVICE FITTINGS

A. See schedule on drawings.

2.08 EMERGENCY PUSHBUTTON (EXTERIOR)

A. Yellow indoor/outdoor surface mount turn to reset stopper station with red pushbutton assembly, 120/240V rated, 1 NO + 1NC contact, ADA compliant, with clear polycarbonate cover suitable for -40 to 250 degrees Fahrenheit, and stainless steel backplate. Provide engraved nameplate above pushbutton that shall read: EMERGENCY POWER OFF. Provide cover that sounds when cover has been opened to prevent accidental or malicious activation.
   1. Manufacturers:
      a. STI SS2 2 1PO-EN
      b. Engineer approved equal.

2.09 EMERGENCY PUSHBUTTON (INTERIOR)

A. Red flush complete illuminated LED pushbutton assembly, 120V rated, 1 NO + 1NC contact, aluminum drilled front plate with fixing screws, and empty flush mounted protective box. Provide engraved nameplate above pushbutton that shall read: EMERGENCY POWER OFF.
   1. Manufacturers:
      a. Square D XB4BW34G5 - Assembly, XAPE301 - Cover, XAPE901 - Box.
      b. Cutler Hammer
      c. Siemens
      d. Engineer approved equal.

2.10 GENERAL PURPOSE CONTACTOR

A. Contactors: NEMA ICS 2 and UL 508; electrically held, 30 amps rated.

B. Coil Operating Voltage: 120 volts, 60 Hertz.

C. Poles: 6, Normally closed.

D. Enclosure: ANSI/NEMA ICS 6; NEMA Type 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that outlet and switch boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that floor boxes are adjusted properly.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings as needed to bring outlet and switch boxes flush with finished surface.

B. Clean debris from outlet and switch boxes prior to device installation.

3.03 INSTALLATION

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Install receptacles with grounding pole on top.

F. Connect wiring device grounding terminal to outlet box with bonding jumper.

G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

H. Connect wiring devices by wrapping conductor around screw terminal.

I. Use oversize plates for outlets installed in masonry walls.

J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

K. The electrical contractor shall verify floor finish and location before ordering floor devices.

L. The feeding of receptacles downstream of GFI receptacles for protection in lieu of providing multiple GFI receptacles is NOT allowed.

M. Install boiler emergency pushbutton per CSD-1, located just outside the boiler room door and marked for easy identification. If the boiler room door is on the building exterior, the switch should be located just inside the door. If there is more than one door to the boiler room, there should be a remote shutdown switch located at each door.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 0533 to obtain mounting heights specified.

B. In masonry walls, switches and receptacle heights shall be adjusted as required such that outlets are at nearest mortar joint to specified height.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

3.08 EXTRA MATERIALS AND LABOR

A. The electrical contractor shall include in their bid an allowance to install an additional five duplex receptacles including an average 50 feet of raceway, associated wiring, back box and labor, and all accessories required to energize each receptacle requested. Receptacle(s) may be added anytime during the construction process as requested by the owner or design team. Any unused devices shall be turned over to the owner at the final acceptance of building.

END OF SECTION 26 27 26

SECTION 26 28 16
ENCLOSED STARTERS AND SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Safety switches

B. Motor-Rated starters and switches

C. Automatic Controllers

1.02 RELATED REQUIREMENTS

A. Specification Section 26 0529 - Hangers and Supports for Electrical Systems

B. Specification Section 26 0553 - Identification for Electrical Systems

C. Specification Section 26 2813 - Fuses

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association

C. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association

D. NFPA 70 - National Electrical Code; National Fire Protection Association

E. NECA - Standard of Installation (published by the National Electrical Contractors Association)

1.04 SUBMITTALS

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

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Project Record Documents: Record actual locations of enclosed switches.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 SAFETY SWITCHES

A. Manufacturers
   1. Square D
   2. General Electric
   3. Eaton
   4. Siemens
   5. Engineer approved equal.

B. Heavy duty safety switches shall be used for all motor loads over 1 HP and all non-motor loads 20 amps and greater.
   1. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
      a. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
      b. Handle lockable in OFF position.
      c. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses, with rejection clips designed to permit installation of Class R fuses only.

d. Indicated as a disconnect switch with a "F" on the drawings.

2. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   a. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   b. Handle lockable in OFF position.
3. Enclosures: NEMA KS 1.
   a. Interior Dry Locations: Type 1 .
   b. Exterior Locations: Type 3R.
   c. Enclosures shall be provided with a method of opening the cover without opening the switch.
4. Enclosure shall include a grounding bar.

2.02 MOTOR-RATED STARTERS AND SWITCHES

A. Manufacturers
   1. Square D
   2. General Electric
   3. Cutler-Hammer
   4. Siemens
   5. Cooper-Bussmann
   6. Engineer approved equal.

B. Motor-rated starters and switches may be used for all motor loads 1 HP and less and all non-motor loads under 20 amps.
   1. Motor-Rated Switch with Fuseholder
      a. Basis of Design: Cooper-Bussmann "STY".
      b. Description: Motor-rated toggle switch disconnecting means with plug fuseholder.
      c. Fuseholder: Designed to accommodate plug fuses. Provide fuse sized per NEC 430.
      d. For use with single-pole motors only.
   2. Nonfusible Motor-Rated Starter
      a. Basis of Design: Square D "Type F".
      b. Description: Fractional horsepower manual starter with melting alloy type thermal overload relay.
      c. Handle lockable in OFF position.
      d. Current rating: 16A
      e. For use with single-phase motors only.
      f. Provide and install thermal units sized per NEC 430.
   3. Nonfusible Motor-Rated Switch
      a. Basis of Design: Square D "Type K".
      b. Description: Fractional horsepower manual switch with melting alloy type thermal overload relay.
      c. Handle lockable in OFF position.
      d. Current rating: 30A
      e. For use with single or three phase motors.

2.03 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Reversing Controllers: Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.

C. Two-Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.

D. Coil Operating Voltage: 120 volts, 60 Hertz.

E. Overload Relay: NEMA ICS; bimetal.

F. Enclosure: NEMA ICS 6, type as required to meet conditions of installation.

G. Auxiliary Contacts: NEMA ICS 2, two each normally open contacts in addition to seal-in contact.

H. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty type.

I. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

J. Pushbuttons: Shrouded type.

K. Indicating Lights: Transformer type.

L. Selector Switches: Hand off/on/auto selector switch type.

M. Relays: NEMA ICS 2.

N. Control Power Transformers: 120 volt secondary in each motor starter. Provide fused secondary, and bond un-fused leg of secondary to enclosure.

O. Electrical contractor shall provide this style motor starter for integrating into controls/BMS. Coordinate with the mechanical contractor.

P. Automatic Controllers shall come with lockable disconnecting means.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install in accordance with manufacturer's instructions.

C. Install plumb and provide in accordance with Specification Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Height to be five foot (5') to operating handle.

E. Install fuses in fusible disconnect switches. Fuses shall not be installed until equipment is ready to be energized.

F. Provide one set of spare fuses of each size and type.

G. Provide adhesive label with white letters on black background for associated equipment.

H. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01 4000.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.2.

END OF SECTION 26 28 16

SECTION 26 43 13
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge Protective Devices - External

B. Surge Protective Devices - Internal

1.02 REFERENCES

A. UL 1283 - Electromagnetic Interference Filters

B. ANSI/IEEE C62.41.1-2002 - IEEE Guide on the Surge Environment in Low Voltage (1000 V and Less) AC Power Circuits

C. ANSI/IEEE C62.41.2-2002 - IEEE Recommended Practice on Characterization of Surge Voltages in Low Voltage AC Power Circuits

D. ANSI/IEEE C62.45-2002 - IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits

E. NFPA 70 - National Electric Code - Article 285

1.03 RELATED SECTIONS

A. Specification Section 26 0519 - Electrical Power Conductors and Cables

B. Specification Section 26 0526 - Grounding and Bonding

C. Specification Section 26 0533 - Raceways and Boxes for Electrical Systems

1.04 SUBMITTALS

A. Product data and manufacturer's installation instructions for non-approved manufacturers shall be submitted for review prior to the bid date.

B. Submittals shall include:
   1. Dimensional drawing of each SPD type.
   2. Dimensional drawing of each SPD enclosure.
   3. UL 1449 Current Edition Listing, Standard for Safety, Surge Protective Devices, documentation.
   4. UL 1283 Listing, Electromagnetic Interference Filters, documentation.
   5. ANSI/IEEE C62.41 and C62.45, Category C3 (20kV-1.2/50, 10kA-8/20microsecond waveform) clamping voltage test results.

PART 2 PRODUCTS

2.01 SURGE PROTECTION DEVICES

A. For external mount device, the manufacturer shall be from approved list below. [For internal mount devices, the manufacturer of the SPD shall be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and shipped.] Also, the distribution equipment shall be fully tested and certified to the following UL standards:
   1. UL 67 = Panelboards.
   2. UL 845 = Motor Control Centers.
   3. UL 857 = Busway.
   4. UL 891 = Switchboards.
   5. UL 1558 = Low Voltage Switchgear.

B. Basis of Design: The system shall be constructed using multiple surge current diversion thermally protected metal oxide varistors (TPMOV). The surge current circuit shall be designed and constructed in a manner that ensures surge current sharing. Use of gas tubes, silicon avalanche diodes or selenium cells are unacceptable unless documentation from a nationally recognized laboratory demonstrates current sharing of all dissimilar components at all surge current levels. The listing of a manufacturer as acceptable does not imply automatic approval .

2.02 SURGE PROTECTION DEVICE MANUFACTURERS

A. ASCO Power Technologies (APT)

B. Square D/Schneider Electric

C. GE

D. Siemens

E. Eaton

F. Liebert

2.03 RATINGS

A. Minimum Surge Current Capability (single pulse rated) Per Phase Shall Be:
   1. Main Service Entrance and Emergency Switchboard: 300 kA per phase/150kA per mode
   2. Distribution Panelboards: 200 kA per phase /100kA per mode
   3. Branch Panelboards: 100 kA per phase/50kA per mode

B. UL 1449 clamping voltage must not exceed the following: Voltage Protection Rating (VPR)

VOLTAGE	L-N	L-G	N-G
240/120	1200/800V	800V	800V
208Y/120	700V	700V	700V
480Y/277	1200V	1200V	1200V

C. UL1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

SYSTEM VOLTAGE	ALLOWABLE SYSTEM VOLTAGE FLUCTUATION (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

D. SPD shall provide suppression for all modes of protection: L-N, L-G, and N-G in WYE systems. (Minimum 7 Modes)

2.04 DESCRIPTION

A. SPD shall be listed in accordance with UL 1449 Current Edition Type 2 device and UL 1283, Electromagnetic Interference Filters.

B. Integrated surge protective devices (SPD) shall be "component recognized" in accordance with UL 1449 Current Edition, Section 37.3.2 and 37.4 at the standards highest short circuit current rating (SCCR) of 200 kA, including intermediate level of fault current testing that will be effective 9/29/2009.

C. SPD shall be tested with the ANSI/IEEE Category C High exposure waveform (20kV-1.2/50ms, 10kA-8/20ms).

D. Pulse Life Test: Capable of protecting against and surviving 5000 ANSI/IEEE Category C High transients without failure or degradation of clamping voltage by more than 10%.

E. Minimum UL 1449 current edition withstand Nominal Discharge Current (In) rating to be 20kA per mode.

F. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

G. SPD shall be constructed of one self-contained suppression module per phase.

H. Visible indication of proper SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each SPD module shall be monitored on the front cover of the enclosure as well as on the module. A

push-to-test button shall be provided to test each phase indicator. Push-to-test button shall activate a state change of dry contacts for testing purposes.

I. SPD shall be equipped with an audible alarm which shall activate when any one of the surge current modules has reached an end-of-life condition. An alarm on/off switch shall be provided to silence the alarm. The switches and alarm shall be located on the front cover of the enclosure.

J. A connector shall be provided along with dry contacts (normally open or normally closed) to allow connection to a remote monitor or other system. The output of the dry contacts shall indicate an end-of-life condition for the complete SPD or module.

K. Terminals shall be provided for necessary power and ground connections.

L. The SPD shall be Equipped the Following Optional Items:
   1. A transient voltage surge counter shall be located on the diagnostic panel on the front cover of the enclosure for the service entrance device . The counter shall be equipped with a manual reset and battery backup to retain memory upon loss of AC power.
   2. A remote monitoring device shall be provided to directly connect to the SPD with a dry contact connector for simple installation. The device will have indicator lights and an audible alarm to monitor for normal and fault conditions.

M. SPD shall have a warranty for a period of ten-years from date of invoice. Warranty shall be the responsibility of the equipment manufacturer and shall be supported by their respective field service division.

PART 3 EXECUTION

3.01 INSTALLATION

A. For external mount devices, install surge protection devices (SPD's) at the power distribution equipment for use at the utility service entrance to the facility and at each distribution switchboard and branch panelboard to be protected.

B. [For internal mount devices, Manufacturer shall install SPD's in the power distribution equipment for use at the utility service entrance to the facility and in each distribution switchboard and branch panelboard to be protected.]

C. The service entrance SPD shall be installed on the load side of a service disconnect overcurrent device per NEC.

D. The SPD's ground shall be connected to the power system ground.

E. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

F. Where the SPD is connected to the power system with cables, keep the conductors as short as possible with no sharp bends.

G. At the service entrance, connect the SPD to a 60 amp circuit breaker. If a 60 amp circuit breaker is not available, a UL-approved disconnect switch shall be provided with the SPD as a means of servicing disconnect.

H. At distribution switchboards and branch panelboards, connect the SPD to a 30 amp circuit breaker. If a 30 amp circuit breaker is not available, a UL approved disconnect switch shall be provided with the SPD as a means of servicing disconnect.

I. Installer may reasonably rearrange circuit breaker locations to ensure shortest and straightest possible leads to SPD's.

J. Provide and install internal or external SPD's with flush mount kits where recessed panelboards are installed in finished spaces.

K. Provide and install a listed SPD in or on all emergency system switchboards, distribution panels and panelboards per NEC 700.8.

END OF SECTION 26 43 13

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. LED Drivers

B. Light Emitting Diodes (LEDs)

1.02 REFERENCES

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006

B. NECA/IESNA 500 - Recommended Practice for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association

C. NECA/IESNA 502 - Recommended Practice for Installing Industrial Lighting Systems; National Electrical Contractors Association

D. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association

E. NFPA 70 - National Electrical Code; National Fire Protection Association

F. NFPA 101 - Life Safety Code

G. IESNA LM-79-08 - Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products

H. IESNA LM-80-08 - Approved Method for Measuring Lumen Maintenance of LED Light Sources.

I. IESNA TM-21-11 - Projecting Long Term Lumen Maintenance of LED Light Sources

J. EU Directive 2002/95/EC - Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS), as amended by directive 2005/618/EC

1.03 SUBMITTALS

A. Provide cut sheet indicating dimensions and components for each luminaire.

B. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Submit manufacturer's operation and maintenance instructions for each product.

D. All lighting submittals must be on Local Authorized Manufacturer Representative's letterhead and contain Project Name and Location.

E. Closeout: Provide list of Extra Materials for owner to verify and sign for acknowledgement of receiving.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and 101

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

C. Products with Light Emitting Diodes:

1. Fixtures shall comply with LM-79-08: Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Interior fixture diode arrays shall maintain +/-100 degrees Kelvin (K); exterior fixture diode arrays shall maintain +/- 500 K color temperature range through the life of the fixture.
3. Diode arrays shall be wired so that if one diode fails, at least 90% of the remaining diodes will operate.

PART 2 PRODUCTS

2.01 LED DRIVERS:

A. Manufacturers must be in business a minimum of (5) years.

B. Drivers shall be provided with light emitting diodes as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.

C. Driver shall be Underwriters Laboratories (UL) listed, Class 2 Outdoor recognized.

D. Driver shall be suitable for damp locations.

E. Driver shall operate from -20 to 60 deg C.

F. Refer to fixture schedule on drawings for additional requirements.

G. Driver shall operate from 50 to 60 Hz input source of 120 V, 208 V, 240V, 277 V and/or 480 V, as required in plans, with sustained variations of +/-10% (voltage and frequency) with no damage to the driver.

H. Driver output shall be regulated to +/- 5% across published load range.

I. Driver shall have an “A” sound rating.

J. Driver shall have a power factor greater than 0.9.

K. Driver input current shall have Total Harmonic Distortion (THD) of less than +/-20% at all operating voltages.

L. Driver shall tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.

M. Driver shall carry a five-year warranty from the date of manufacture against defects in material or workmanship, including replacement for operation at a maximum case temperature of 90 deg C.

N. Driver shall have an efficiency greater than or equal to 85%.

O. Driver shall comply with Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 15, Non-consumer (Class A) for EMI/RFI (conductive and radiated).

P. Driver shall not contain any Polychlorinated Biphenyl (PCB).

2.02 LIGHT EMITTING DIODES (LEDS):

A. Manufacturers must be in business for a minimum of (5) years.

B. Light Emitting Diodes shall be provided with a driver as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.

C. Diode arrays shall maintain +/-100K color temperature through the life of the fixture.

D. Diodes shall have a minimum color rendering index of 80.

E. Diodes and associate circuitry shall be RoHS compliant.

F. Diodes shall be photometrically tested for compliance with IESNA LM-80-08, with projections calculated in accordance with IESNA TM-21-11.

G. Diode arrays shall maintain a minimum 70% lumen output through an average operating life of 50,000 hours.

H. Diodes and associated printed circuit boards shall be RoHS compliant.

I. Refer to Lighting Fixture Schedule for color temperature requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Furnish products as specified in schedule on the drawings.

C. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required suspending luminaire at indicated height.

D. Locate recessed ceiling luminaires as indicated on reflected ceiling drawing and electrical lighting drawings.

E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

F. Install recessed luminaires to permit removal from below.

G. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.

H. Install clips to secure recessed grid-supported luminaires in place.

I. Install recessed can luminaires to fit in ceiling. Provide all necessary trim ring extenders or other accessories for proper installation of luminaire in ceiling.

J. Install wall mounted luminaires, emergency lighting units and exit signs at height as scheduled.

K. Install accessories furnished with each luminaire.

L. Fixture whips utilizing THHN/THWN-2 wire in flexible metal conduit shall be used to connect all luminaires, emergency lights, and exit signs. Minimum wire size for all fixture whips shall be 14 AWG. Fixture whips shall be wired directly from the luminaire to an accessible junction box. Fixture to fixture whips are not allowed. Maximum length for any fixture whip shall be 6'.

M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

N. Bond products and metal accessories to the branch circuit equipment grounding conductor.

O. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.

P. Support luminaires larger than 2' x 4' size independent of ceiling framing.

3.02 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.03 ADJUSTING

A. Aim and adjust luminaires as directed.

B. Position exit sign directional arrows as indicated.

3.04 WARRANTIES

A. All warranties shall remain as an agreement between the installing contractor and the manufacturer. No third parties shall be involved with warranty repairs or replacements of installed products without the written consent of the installing contractor and the owner or their representative.

B. Labor for warranty repairs shall be billed by the contractor directly to the manufacturer or distributor during the duration of the labor warranty on the originally installed products. Labor work required on warrantied parts, but outside of the 1-year labor warranty shall be the responsibility of the owner.

3.05 CLEANING

A. Clean all electrical parts to remove all of the conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.06 SCHEDULES

A. See the drawings.

3.07 EXTRA MATERIAL AND LABOR

A. The electrical contractor shall include in their bid an allowance to install an additional two exit signs of each type and two emergency battery pack fixtures of each type as scheduled including an average 50 feet of raceway, associated wiring, back box and labor, and all accessories required to energize each device requested. Fixture(s) may be added anytime during the construction process as requested by the owner or design team. See schedule on drawings for types. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

B. Drivers:
   1. The electrical contractor shall include in their bid, two (2) additional drivers for all wattages, voltages, and configurations required on the project.
   2. Extra materials shall be turned over to the owner at substantial completion in their original unopened packaging.
   3. All drivers shall be clearly marked for the fixture types that they are compatible with based on the drawings, fixture schedule and submittals received.
   4. Extra drivers included in this requirement shall not be used for warranty replacements without replacing this extra stock in the owner's inventory.
   5. No labor should be added to the project over the standard warranties already required in previous sections.

END OF SECTION 26 51 00

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Luminaries and accessories

B. LED drivers

C. Light emitting diodes (LEDs)

D. Precast pole base

E. Metal poles

1.02 REFERENCES

A. IES RP-8-14 - Recommended Practice for Roadway Lighting

B. IES RP-20-14 - Recommended Practice for Lighting for Parking Facilities

C. IES RP-33-14 - Recommended Practice for Lighting for Exterior Environments

D. NFPA 70 - National Electrical Code

E. ANSI C78.377 - SSL Chromaticity Specification

F. NEMA SSL 3-2011 - High-Power White LED Binning for General Illumination

G. IES LM-79-08 - Electrical and Photometric Measurements of Solid-State Lighting Products

H. IES LM-80-08 - Approved Method for Lumen Maintenance Testing of LED Light Sources

I. IES TM-21-11 - Projecting Long Term Lumen Maintenance of LED Light Sources

J. IES LM-82-12 - Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.

K. IES TM-15-11 - Luminaire Classification System for Outdoor Luminaires (BUG ratings)

L. NFPA 101 - Life Safety Code

1.03 TERMS AND DEFINITIONS

A. ANCHOR BASE - Base plate used to anchor poles to pole footing.

B. ANNODIZED - Electro-chemical process that produces a very strong oxide coating on the surface of the pole. This coating shall be very resistant to scratches and corrosion.

C. ANTI-GRAFFITI - A coating applied to the finished pole that allows easy removal of painted graffiti. Graffiti shall be able to be removed with manufacturer approved solvents without harming manufacturer's paint finish.

D. BUG RATING - Backlight, Uplight, Glare. Replaces the old system of cut-off, semi-cut-off and not cut-off.

E. EPA - Effective Projected Area of a luminaire which is its actual projected area times its coefficient of drag.

F. GROUNDING PROVISION - A drilled and tapped hole located near the hand hole to allow attachment of the ground connection and grounding wire.

G. MOUNTING HEIGHT - The height measured from finished grade level to the position of the luminaire on the pole.

H. POWDERCOAT PAINT - An electrostatically applied powder paint that is then oven cured on to the pole.

1.04 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide dimensions, ratings, and performance data.

C. Test Reports: Submit LM-79 test reports and/or DLC paperwork as required for rebates

D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Provide maintenance data for each luminaire.

F. Provide additional light fixture components including driver cutsheets with each fixture.

G. All lighting submittals must be on Local Authorized Manufacturer Representative's letterhead and contain Project Name and Location.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

D. Electrical Contractor shall be responsible for all costs associated with the installation of the pole footing and the footing itself in their bid. Coordinate means and methods and actual coordinate locations with contractor and design team prior to commencing work.

E. [Not Common] Refer to Poured in Place Concrete specification for required mix. It is the Contractor’s responsibility to provide the electrical contractor with a soils report- to the depth required for the footing- so that the structural engineer can design the footing to meet the design guidelines outlined above.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

C. Provide products with specified ingress protection (IP) ratings where required.

D. Provide products with specified impact resistance (IK) ratings where required.

E. Provide poles with shaft size and thickness to account for current AASHTO wind map ratings for the project location. Coordinate with manufacturer’s EPA rating for all devices attached to pole.

F. Products with Light Emitting Diodes:
   1. Fixtures shall comply with LM-79-08: Electrical and Photometric Measurements of Solid-State Lighting Products.
   2. Exterior fixture diode arrays shall maintain +/- 500 K color temperature range through the life of the fixture and utilize 70+ CRI sources.
   3. Diode arrays shall be wired so that if one diode fails, at least 90% of the remaining diodes will operate.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store and handle solid wood poles in accordance with ANSI O5.1.

B. Protect luminaire finishes, lenses and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.

C. Protective materials on poles while in storage shall not result in any permanent marks on the paint finish of the poles. Manufacturer shall fully instruct contractor as to required storage and acceptable temperature extremes for the packing materials.

D. All metal poles shall be fully protected from moisture and corrosion prior to installation. Touch up paint in the field will not be accepted.

1.08 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations prior to pole ship date.

B. Contractor shall review site conditions and geotechnical reports prior to installing any pole footings. Alert design team if poor soil conditions or subgrade obstructions are encountered during installation.

PART 2 PRODUCTS

2.01 LUMINAIRES AND ACCESSORIES

A. See schedule on drawings.

B. No fiberglass poles will be permitted.

C. Listed for wet or damp location as scheduled.

D. Meet required and listed IP ratings.

E. Provide low temperature (-20deg F) LED drivers.

2.02 LED DRIVERS:

A. Manufacturers must be in business a minimum of (5) years.

B. Drivers shall be provided with light emitting diodes as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.

C. Driver shall be Underwriters Laboratories (UL) listed, Class 2 Outdoor recognized.

D. Driver shall be suitable for wet locations.

E. Driver shall operate from -20 to 60 deg C.

F. Refer to fixture schedule on drawings for additional requirements.

G. Driver shall operate from 50 to 60 Hz input source of 120 V, 208 V, 240V, 277 V and/or 480 V, as required in plans, with sustained variations of +/-10% (voltage and frequency) with no damage to the driver.

H. Driver output shall be regulated to +/- 5% across published load range.

I. Driver shall have an “A” sound rating.

J. Driver shall have a power factor greater than 0.9.

K. Driver input current shall have Total Harmonic Distortion (THD) of less than +/-20% at all operating voltages.

L. Driver shall tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.

M. Driver shall carry a five-year warranty from the date of manufacture against defects in material or workmanship, including replacement for operation at a maximum case temperature of 90 deg

N. Driver shall have an efficiency greater than or equal to 85%.

O. Driver shall comply with Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 15, Non-consumer (Class A) for EMI/RFI (conductive and radiated).

P. Driver shall not contain any Polychlorinated Biphenyl (PCB).

2.03 LIGHT EMITTING DIODES (LEDS):

A. Manufacturers must be in business a minimum of (5) years.

B. Light Emitting Diodes shall be provided with a driver as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.

C. Diode arrays shall maintain +/-100K color temperature through the life of the fixture.

D. Diodes shall have a minimum color rendering index of 70.

E. Diodes shall be photometrically tested for compliance with IESNA LM-80-08, with projections calculated in accordance with IESNA TM-21-11.

F. Diode arrays shall maintain a minimum 70% lumen output through an average operating life of 50,000 hours.

G. Diodes and associated printed circuit boards shall be RoHS compliant.

H. Refer to Lighting Fixture Schedule for color temperature requirements.

2.04 PRECAST POLE BASE

A. Provide engineered shop drawing for pole base for approval.

B. Coordinate bolt pattern and special requirements with light fixture and light pole.

C. Pole base is to have three foot (3') exposed above grade when not protected by a curb. Pole base is to have six inch (6") exposed above grade when protected by a curb. Refer to pole base detail on the electrical drawings for more information.

D. Top of base is to have beveled canted edge.

E. Pole color or aggregate finish is to be determined by architect during submittal phase.

F. Bottom of base shall be located below frost line at each location installed. Refer to the drawings for additional information regarding light pole base dimensions and details.

G. Pole base shall be painted by the general contractor. Final color selection shall be chosen by the design team.

2.05 METAL POLES

A. Refer to fixture schedule for specific metal pole requirements.

B. Steel Poles

1. Pole Shaft: The pole shaft shall be one or two section design, each section being fabricated from standard 11 gauge (0.1196"), 7 gauge (0.1793"), or 3 gauge (0.2391") steel. The pole shaft material shall be a weldable grade hot rolled commercial quality carbon steel with a guaranteed minimum yield strength of 55,000 psi after fabrication. Each section shall be one-piece construction with a full length longitudinal weld and shall be cylindrical in cross-section having a uniform taper of 0.14 inches of diameter change per foot of length.
2. Base Plate: The anchor base shall be fabricated from structural quality hot rolled carbon steel plate that meets or exceeds a minimum yield strength of 36,000 psi. The anchor base telescopes the pole shaft and shall be circumferentially welded top and bottom. All welds shall be performed in accordance with the American Welding Society specification AWS D1.1, latest edition.
3. Anchor Bolts: Anchor bolts shall be fabricated from commercial quality hot rolled carbon steel bar that meets or exceeds a minimum yield strength of 55,000 psi. Four properly sized anchor bolts, each with two regular hex nuts and washers, shall be furnished and shipped with all poles unless otherwise specified. Anchor bolts shall have the threaded end galvanized a minimum of eight inches (8") in accordance with ASTM A-153.
4. Handhole: Provide an oval reinforced gasketed handhole, having a nominal 4" x 6-1/2" inside opening, located 1'-6" above base and a grounding provision shall be located inside the handhole ring.
5. Finishes: The Standard finish shall be a polyester thermosetting powder coating applied to the surface of the substrate to a minimum of 3 mils.
6. Structure: Poles shall be designed for luminaire size and suitable for AASHTO wind charts for the project location.
7. Vibration dampeners: All poles over 12’ tall shall have an internal vibration dampener. The dampener shall include a rubberized coating so as to prevent excessive metal-on-metal noise during high wind events.

C. Aluminum Poles

1. Pole Shaft: The shaft shall be constructed of seamless extruded tube of Aluminum Alloy 6063(round shafts) or Aluminum Alloy 6063 (square shafts) per the requirements of ASTM B221 of sufficient nominal thickness to meet the design requirements without the use of internal reinforcing sleeves. No longitudinal shaft welds shall be allowed. The shaft shall be

full-length heat treated after welding to produce a T6 temper in round shafts and a T5 temper in square shafts. The heat-treating oven used shall be certified to meet the requirements of ASTM B597 and Mil-H-6088 specifications. An aluminum pole cap utilizing stainless steel attaching screws will be provided when required.

2. Base Plate: The 4-Bolt base flange for attachment to the foundation or to the transformer base shall be of cast Aluminum Alloy 356-T6. Base flange shall be joined to pole shaft by means of complete circumferential welds; externally at the top of flange and internally at bottom of shaft tube. Four anchor bolt covers of cast Aluminum Alloy 356-F with stainless steel hex head attaching screws shall be provided
3. Anchor Bolts: Anchor bolts shall be fabricated from commercial quality hot rolled carbon steel bar that meets or exceeds a minimum yield strength of 55,000 psi. Four properly sized anchor bolts, each with two regular hex nuts and washers, shall be furnished and shipped with all poles unless otherwise specified. Anchor bolts shall have the threaded end galvanized a minimum of eight inches (8") in accordance with ASTM A-153.
4. Handhole: Poles shall feature a 4" x 6-1/2" handhole with curved lap style aluminum door and two (2) stainless steel self-tapping attaching screws. A grounding provision incorporating a tapped ¼”-20NC hole shall be provided opposite the handhole
5. Finishes: The Standard finish shall be a polyester thermosetting powder coating applied to the surface of the substrate to a minimum of 3 mils.
6. Structure: Poles shall be designed for luminaire size and suitable for AASHTO wind charts for the project location.
7. Vibration dampeners: All poles over 12’ tall shall have an internal vibration dampener. The dampener shall include a rubberized coating to prevent excessive metal-on-metal noise during high wind events.

PART 3 EXECUTION

3.01 FINISHES

A. Pole shafts shall be satin ground, chemically etched, sanded or shot blasted to ensure proper powder coat surface adhesion. To ensure that the prepared parts are kept clean and not exposed to dirt, dust, grease or oil and to ensure maximum powder coat adhesion, the product shall proceed continuously and immediately to the powder coating process within the same facility where the poles and arms are manufactured.

B. Powder coating material shall be a thermosetting polyester powder. A minimum coating thickness of 3.0 mils shall be maintained for aluminum and steel poles.

C. Steel poles shall receive an additional internal rust inhibitor prior to receiving the final finish coat (required when 5-year warranty is specified).

D. The powder coating system shall employ a powder recovery system utilizing closed loop quick-change technology to achieve efficient and contamination free color changes. The powder shall be applied only when both the ambient and part temperatures are 50 degrees F. or above. Once powder coated, the product shall proceed through a curing oven operating at 400 degrees Fahrenheit that has been surveyed and certified for temperature uniformity. The product shall move continuously through the oven from beginning to end and shall attain the appropriate time at temperature to cure the finish in accordance with the paint manufacturer’s recommendations. Once oven cured, the product shall move immediately to and continuously through a forced air cooling tunnel designed to restore the product to acceptable packaging temperature prior to inspection and packaging. Upon exiting the cooling tunnel the product shall be immediately inspected and packaged.

3.02 INSTALLATION

A. Provide concrete bases for lighting poles at locations indicated.

B. Install poles plumb and provide double nuts to adjust plumb. Grout around each base.

C. Install lamps in each luminaire.

D. Bond luminaires metal accessories and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

E. Grout between pole and concrete base. Grout color to match pole base.

F. Refer to specification section 26 0943 for lighting controls requirements.

G. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.03 WARRANTIES

A. Light Fixtures
   1. Light fixture manufacturer shall warranty LED array, and all associated components for a period of 5-years from date of shipment which shall include full replacement of any failed components. Labor shall be reimbursed to the contractor on a pro-rated basis.

B. Poles
   1. Steel poles shall be warrantied to be free of defects in material and workmanship for a period of one (1) year from the date of shipment.
   2. Aluminum poles shall carry a lifetime warranty to be free of defects in material and workmanship and free from corrosion.

C. Paint Finishes
   1. Factory applied powder coated finishes shall be warranted against cracking, peeling or excessive fading due to normal climatic exposure for a period of five (5) years from the date of shipment. Damage to the finish coating caused by mechanical abuse, such as rough handling during installation or vandalism, is not covered by these warranties.

D. All warranties shall remain as an agreement between the installing contractor and the manufacturer. No third parties shall be involved with warranty repairs or replacements of installed products without the written consent of the installing contractor and the owner or their representative.

E. Labor for warranty repairs shall be billed by the contractor directly to the manufacturer or distributor during the duration of the labor warranty on the originally installed products. Labor work required on warrantied parts, but outside of the 1-year labor warranty shall be the responsibility of the owner.

3.04 ADJUSTING AND CLEANING

A. Clean lighting fixtures of dirt and debris upon completion of installation.

B. Clean all electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

F. Any adjustment to aiming of the light fixtures in the field shall be completed in the presence of the lighting designer, contractor and architect.

3.05 EXTRA PRODUCTS

A. Drivers - The electrical contractor shall include in their bid, two (2) additional drivers for all wattages, voltages and configurations required on the project.
   1. Extra materials shall be turned over to the owner at substantial completion in their original unopened packaging.
   2. All drivers shall be clearly marked for the fixture types that they are compatible with based on the drawings, fixture schedule and submittals received.
   3. Extra drivers included in this requirement shall not be used for warranty replacements without replacing this extra stock in the owner's inventory.
   4. No labor should be added to the project over the standard warranties already required in previous sections.

END OF SECTION 26 56 00

SECTION 27 00 50

BASIC COMMUNICATIONS REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Communications Requirements specifically applicable to Electrical Division Specification Sections.

B. Division 27 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 WORK BY OWNER

A. The Following Work or Sub Contracts Will Be Furnished and Installed (OFOI) By The Owner:
   1. Telephone system equipment and installation.
   2. Computer network equipment and installation.
   3. Computer workstation equipment and installation.
   4. Outside plant fiber cabling, termination, and testing. (Electrical contractor shall provide pathways)

B. The Following Products Will Be Furnished By The Owner Bidding Contractor Shall Install (OFCI):
   1. Wireless access point (WAP) hardware (bidding contractor shall install).
   2. Television/Monitors (Contractor Installed)
   3. Television/Monitor Mounts (Contractor Installed)

C. Owner's Responsibility:
   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.

D. Contractor's Responsibility:
   1. Review owner reviewed shop drawings, product data and samples.
   2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
   3. Handle, store, install and finish products. Install electrical wiring and devices.
   4. Repair and/or replace items damaged after receipt.

1.03 OWNER OCCUPANCY

A. The owner will occupy the Operations Building premises during the construction period.

B. The owner will not occupy the Bus Barn premises during the construction period.

C. Limit use of site and premises to allow owner occupancy.

D. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

E. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by themselves, by their employees or through any operation under their charge, whether in the contract or extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:
   1. National Board of Fire Underwriters
   2. ANSI-NFPA 70 National Electrical Code
   3. National Fire Protection Association (NFPA)
   4. Occupations Safety and Health Act (OSHA)
   5. IBC Building Code (current) and any current applicable city building and or electrical codes.
   6. Fire Protection: Conform to International Fire Code (IFC) and NFPA
   7. International Energy Conservation Code (IECC)
   8. The Joint Commission
   9. Iowa Administrative Code, Chapter 61

F. Obtain permits and request inspections from authority having jurisdiction.

G. Conform to latest approved versions of codes.

1.05 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.

C. This contractor shall, before submitting their bid, visit the site of the project to familiarize themselves with locations and conditions affecting their work.

D. It is the intent of this specification that the contractor furnishes all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.

F. This contractor shall provide holes as necessary for the installation of their work and in accordance with materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in this project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for electrical lines and conduit is limited, it is imperative that all such trades coordinate their work so as to ensure concealment in space provided. Where conflict exists, the design team shall decide priority of space. If work is not properly coordinated, the design team may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturer and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction, the contractor shall check and verify with the owner each item of existing equipment that must be removed.

B. The owner will designate which items of material or equipment not reused that he may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for their use shall become the property of the contractor and shall be removed from the site.

1.10 PROTECTION AND MAINTENANCE

A. The work covered by these drawings and specifications involves all work in the new and existing building.

B. Where necessary to connect to any existing utility service, this electrical contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

D. This contractor shall protect existing equipment in finished areas from dirt, dust, and damage as a result of their work.

E. Coordinate protection requirements with department heads before beginning construction.

F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 DEMOLITION

A. This contractor shall be responsible for the demolition and removal of all existing system elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be reused".

2. Elements serving adjacent areas.
3. Elements required for the support of the newly remodeled areas.
4. All elements to be removed are subject to the Owner's Right of Salvage.

B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.12 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of their work in all existing and new buildings unless otherwise noted.

B. In areas where the integrity of fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.

C. This contractor shall do all cutting and patching required for their work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

A. This contractor, upon completion of their work, shall remove all rubbish and debris resulting from theirs operation and shall remove it from site at their own expense.

B. As far as their work is concerned, all equipment shall be cleaned and the premises left in first class condition.

C. This contractor shall maintain the work area each day to prevent hazardous accumulation of debris from their work.

1.14 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
1. Dow Corning "Silicone RTV Foam"
2. 3-M Corporation "Fire Barrier Caulk and Putty"
3. Thomas and Betts "Flame Safe Fire Stop System"
4. Specified Technologies "EZ-Path"

D. Installation of these products are to be in strict accordance with the manufacturer's recommendations and architectural specifications, details or equivalent fire stopping general specification section.

E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 HAZARDOUS MATERIALS

A. If the contractor stores any hazardous solvents or other materials on the site, they shall obtain copies of the safety data sheets for the materials and post them at the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.
1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.16 SUBMITTALS / RECORD DOCUMENTS

A. All submitted documents shall be:
1. Digital (scanned documents are not acceptable)
2. Current, within last 5 years.

3. Complete and in sufficient detail to allow ready determination of compliance with contract documents.
4. Have options clearly indicated as applicable to each submittal.
5. Refer to Architectural Specification Sections for additional requirements.

1.17 ALTERNATES

A. Refer to description of alternate bids under General Specification Sections.

1.18 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer, for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels he proposes to furnish. The brochure shall contain complete information as to the model of equipment, type, size, capacities, dimensions, and illustration. An electronic copy shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless he notifies engineer, in writing, of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set signifying that the contractor has checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.19 TEST OF SYSTEMS

A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall coordinate all testing of systems within Division 27 specification section. Follow manufacturer's recommended testing procedures as a minimum unless the following related specification section has further detail of testing procedures. The more stringent testing procedure shall be used.

1.20 SCOPE OF WORK

A. This contractor shall furnish all the labor and material to install a complete communication system in the new building. The system shall include all items of work as outlined in these specifications and on the drawings.

B. All work shall be performed by a well-qualified, licensed or certified technician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their technicians are familiar with all the various codes, installation procedures and tests applicable to this work.

C. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

D. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.

E. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.

F. This contractor, shall before proceeding with any work, review the architectural drawings and specifications. Any conflict between the technology and architectural drawings and specifications shall be reported to the engineer for clarification.

G. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

H. The Communications Contractor shall establish system elevations prior to fabrication and installation. The Communications Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate.
   3. Electrical bus duct.
   4. Sheet metal.
   5. Cable trays, including access space.
   6. Other piping.
   7. Conduits and wireway.

I. Low Voltage Cable Installation
   1. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Cablofil or Caddy Cable CAT. No cable shall be allowed to lie on accessible ceilings tiles. Provide sleeves between walls and accessible clouds. Provide hooks with closure holes. Mount hooks 3 feet on center.
   2. All vertical riser and telecommunication room cabling shall be properly supported and bundled by approved velcro straps every 3 feet. Cable ties (zip ties), or other tie systems that cause compression, crushing, or pinching of cabling shall not be allowed.

1.21 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. All underground utilities, telephone conduit, parking lot lighting, tunnels, etc shall be exactly located prior to digging. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional information.

1.22 DAILY HOUSEKEEPING AND CLEANING

A. At the end of each workday, the contractor shall remove all of their debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor, for the removal of debris from the project, shall not use the owner's waste disposal facility.

B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.23 WALL CONTINUITY (1 HR.)

A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.

B. Any system panels in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.24 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.25 SECURE NETWORKABLE DEVICES

A. Update network devices to the most current software/firmware.

B. Change default password of all networkable devices.
   1. Passwords shall have at least eight characters.
   2. Include uppercase and lowercase letters, numerals, and special characters

C. Supply MAC address and serial number of all networkable devices.

D. Work with the Owner's IT department to align to existing IT standards.

E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.26 SYSTEM CONFIGURATION AND PROGRAMMING FILES

A. Supply system configuration and programming files where export is available.

B. Supply uncompiled programming for systems applicable.

C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 27 00 50

SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding clamps

B. Splice

C. Grounding lugs

D. Telecommunications bonding backbone

E. Wall-mount busbars

F. Rack mount grounding strip

1.02 RELATED SECTIONS

A. Specification Section 26 0526 - Grounding and Bonding for Electrical System

B. Specification Section 27 0528 - Pathways for Communication Systems

C. Specification Section 27 1005 - Telecommunications Cabling Infrastructure

1.03 REFERENCES

A. ANSI/NFPA-70 2014 National Electrical Code (NEC)

B. ANSI/IEEE Std. 1100-2005 - Recommended Practice for Powering and Grounding Electronic Equipment

C. TIA-607-B Telecommunications Grounding (Earthing) and Bonding for Customer Premises

D. ANSI/TIA-606-B Administration Standard for Telecommunications Infrastructure

E. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

1.04 SUMMARY

A. Provide a communications bonding and grounding system as described within this specification and drawings. System shall be in compliance with the above cited Codes, Standards and Agencies.

B. Comply with the requirement for Section 26 0526 - Grounding and Bonding for Electrical System.

C. Bond the following items within the telecommunications grounding system:
   1. All communications system active equipment.
   2. All PDU and surge protection equipment.
   3. Metallic raceway systems, including metallic cable trays.
   4. Communications equipment enclosures (cabinets) or cross-connect frames.
   5. Broadband passive devices.
   6. Metallic splice cases.
   7. Metallic cable screens, armor or shields.
   8. All metal cable conduit.
   9. Electrical service panels in entrance facilities, telecommunications and equipment rooms.
   10. Wall and rack mounted grounding busbars.
   11. Exposed building steel that is within 6 feet of equipment racking systems.
   12. Building steel extending to earth in outside-plant.
   13. All related bonding accessories.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   2. Grounding to conform to applicable building codes.

3. Methods of construction that are not specifically described or indicated in the contract documents to be subject to the control and approval of the owner or their official representatives.
4. Equipment and materials specified shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed.
5. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to written approval by the owner per the substitution policy listed within these specifications.
6. Materials and methods shall comply in every way with above cited Standards and Codes.

1.06 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years.
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents.
   4. Have options clearly indicated as applicable to each submittal.

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings. Include electrical characteristics and connection requirements.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable building code for requirements applicable to work specified herein.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact. Deliver items in their original factory shipping cartons.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.09 APPROVED MANUFACTURERS

A. Panduit

B. Chatsworth Products, Inc.

C. Hoffman

D. Engineer approved equal.

PART 2 PRODUCTS

2.01 GROUNDING CLAMPS

A. Pipe Clamps:
   1. Used to ground copper code conductor to water pipe or copper tubing.
   2. Cast from high strength, electrolytic bronze to provide reliable grounding connections.
   3. Plated steel screws provide high strength and inhibit corrosion.
   4. Accommodates a wide range of pipe, tube, rod and conductor sizes.
   5. UL 467 Listed for grounding and bonding with AWG conductor.

B. Bronze Grounding Clamps for Conduit:
   1. Used to ground copper code conductor parallel to, or at a right angle to a rod, tube, or pipe.
   2. Made from high strength, electrolytic cast bronze.
   3. Accommodates a wide range of pipe, tube, rod and conductor sizes.
   4. UL 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.

C. Bronze Grounding Clamps with Lay-in Feature:
   1. Bonds water pipe to continuous copper grounding conductors.
   2. Made from high strength, electrolytic cast bronze.
   3. Bronze hardware provides long term reliable assembly.
   4. UL 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.

D. Zinc Ground Clamp:
   1. Bonds steel and aluminum pipe to aluminum conductors.
   2. Made from die cast zinc.
   3. Zinc plated steel hardware.
   4. UL 467 Listed for grounding and bonding.

E. Universal Beam Grounding Clamp:
   1. For bonding structural steel such as I-Beams into bonding network.
   2. Universal, fits on a wide range of standard (angled) and wide flange (parallel) structural steel beams.
   3. Provide a mounting pad suitable for a two-whole compression lug.
   4. Installs quickly and easily with standard ¼" key hex wrench tooling.
   5. UL 467 Listed and CSA 22.2 Certified for grounding and bonding suitable for direct burial in earth or concrete.
   6. Comply with vibration tests per MIL-STD-202G.

2.02 SPLICE

A. Compression-type Aluminum-to-Copper Reducing Splice:
   1. Dual rated for use with aluminum or copper conductors.
   2. Factory pre-filled with joint compound and sealed with easy pull-out end plug to inhibit corrosion.
   3. Color-coded end plug and die index numbers marked on barrel for proper crimp die selection.
   4. Tin-plated to inhibit corrosion.
   5. For use up to 35KV and temperature rated 90 degree C when crimped with manufacturer rated crimping tools and dies.

B. Code/Flex Conductor H-TAPs:
   1. Used as a splice, or to tap smaller conductors into larger continuous conductors.
   2. Each HTAP terminates a wide range of conductor sizes and combinations of code and flex conductors Class G, H, and I to suit a variety of applications.
   3. Tap grooves are separated from one another, allowing them to function independently so HTAP can be used with single or multiple conductors, providing maximum design and installation flexibility.
   4. Color coded and marked with manufacturer die index numbers for proper crimp die selection.
   5. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600V when crimped with manufacturer rated tools and dies.
   6. Tin plated to inhibit corrosion.

C. Code Conductor, Thin Wall, Tin -plated C-TAP:
   1. For copper-to-copper splicing or pigtail tap splicing.
   2. Wide wire range-taking capability minimizes inventory requirements.
   3. Color-coded for proper crimp die selection.
   4. Ribbed design provides high strength.
   5. Made from high conductivity wrought copper.
   6. Tin-plated to inhibit corrosion and oxidation.
   7. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600V when crimped with manufacturer rated tools and dies.

2.03 GROUNDING LUGS

A. Copper and Aluminum One-Hole Grounding Lay-in Lug for Bonding Ladder Rack:
   1. Used for quick installation of a continuous grounding conductor.
   2. UL 467 Listed for grounding and bonding, copper lugs. UL Listed for direct burial in earth or concrete.
   3. UL 467 Listed for use up to 600V and temperature rated 90 degree C.

B. Two-hole, Long-barrel Copper Compression Lugs for Grounding Conductors:
   1. Meets TIA-607-B requirements for network systems grounding applications.
   2. Tested by Telcordia - meets NEBS Level 3 with AWG conductor.
   3. For use up to 35KV and temperature rated 90 degree C when crimped with manufacturer rated crimping tools and dies.
   4. Color-coded barrels marked with manufacturer's die index numbers for proper crimp die selection.
   5. Have long barrel to maximize number of crimps and provides premium wire pull-out strength and electrical performance.
   6. Have "inspection window" over tongue to visually assure full conductor insertion.
   7. Be tin-plated to inhibit corrosion.
   8. Available with NEMA and BISCI hole-sizes and spacing.

2.04 TELECOMMUNICATIONS BONDING BACKBONE (TBB) GROUNDING CONDUCTORS

A. To be bare or insulated copper, of minimum conductor size #6 AWG and sized at 2 kcmil per linear foot up to a maximum of 750 kcmil. For details on TBB sizing see "Execution" section at end of this document.

B. Where un-insulated, to be identified with green tape at termination location.

C. Labeled in accordance with recommendations set forth in ANSI/TIA-606-B Administration for Telecommunications Infrastructure.

2.05 WALL MOUNT BUSBARS (TMGB/TGB)

A. Meet BICSI and TIA-607-B requirements for network systems grounding applications.

B. Employ BICSI hole spacing to 2-hole lugs.

C. Be made of high conductivity copper and tin-plated to inhibit corrosion.

D. Come pre-assembled with brackets and insulators attached for quick installation.

E. Use labels to identify busbars to meet TIA/EIA-606-A.

2.06 RACK MOUNT GROUNDING STRIP

A. Provide clean bond to any rack mounted equipment regardless of whether or not equipment has an integrated grounding terminal.

B. EIA Universal hole pattern.

C. Provide length required to bond up to 45 RU per rack.

PART 3 EXECUTION

3.01 GENERAL

A. It shall be the responsibility of this contractor to adapt the following general guidelines and principles for the requirements of the actual environments where the grounding and bonding systems are to be implemented.

B. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside-plant earthing system to each telecommunication room ground busbar, through the racking systems to bond the network equipment.

C. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit or pathways.

D. Installing contractor shall label all elements of the communications bonding network according to guidelines defined in TIA-607-B and ANSI/TIA 606-B.

E. It is the responsibility of the installer to be knowledgeable of all previously cited Standards and Codes and to bring to the attention of the engineer any conflicts discrepancies to achieve a fully functioning, standards-compliant earthing system.

3.02 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

A. Bonding and grounding conductors may be insulated or un-insulated and shall not decrease in size as the grounding path moves closer to earth.

B. Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in TIA 607-B and applicable electrical codes.

C. Bonding Conductors should be continuous and routed in the shortest possible straight line path, avoiding changes in elevation and sharp bends.

D. TBB conductors shall be protected from mechanical damage and built so as to minimize splicing. Where splicing is unavoidable they shall be done using irreversible compression splices (C-TAPS) built to that purpose. See the Materials section of this document for appropriate compression splices.

E. TBB in multi-story buildings with multiple risers shall employ a grounding equalizer (GE) between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The GE shall be no smaller than the largest sized TBB.

F. Routing grounding conductors through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized HTAP.

G. Conductors used to bond TBB to conduit ends shall be of #6 AWG size or larger.

H. Provide appropriately sized TBB conductor using the pathway distances and the chart found in TIA 607-B.

3.03 ENTRANCE FACILITIES AND TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

A. TMGB shall be located in the entrance facility, near the electrical panel to which it will be bonded but installed to maintain clearances required by applicable electrical codes.

B. TMGB shall be sized according to the anticipated number of bonded connections needed.

C. TMGB shall have tinned surface to restrain oxidation and be cleaned and antioxidant paste applied prior to fastening conductors.

D. Connectors on TBB which attach to TMGB shall be of two-hole, long-barrel compression lugs as specified in the Materials section of this document.

E. Building steel within six feet of the communications grounding system should be bonded into the system with appropriate hardware.

F. All cables containing a metallic shield or armor shall have that shield properly bonded into the communications grounding system using appropriately sized grounding kits from the approved manufacturers.

3.04 TELECOMMUNICATIONS ROOMS AND TELECOMMUNCATIONS GROUNDING BUSBAR (TGB)

A. Each telecommunications room shall have its own TGB to which equipment and dead steel in that room are bonded.

B. The TGBs shall be sized according to the anticipated number of bonded connections needed.

C. TGBs shall have tinned surfaces to restrain oxidation and shall be cleaned and have an antioxidant paste applied to both bonding surfaces prior to fastening conductors.

D. Connectors on backbone and rack/cabinet bonding conductors which attach to TGB shall be of two-hole, long barrel compression lugs as specified in the Materials section of this document.

E. Building steel within six feet of the communications grounding system shall be bonded into the system with beam clamps and other hardware appropriate to that purpose.

F. Racks and cabinets shall have individual Rack Bonding Conductors bonding to the Telecommunications Equipment Bonding Conductor. **Daisy chaining or serial connections of one rack or cabinet to another will not be accepted.**

G. Rack Bonding Conductors or above rack row grounds (TEBC) shall be installed to maintain a minimum of 2" separation from all other types of cable - power or communications.

H. To maintain this segregation of cables some telecommunications rooms may lend themselves to the installation of Auxiliary Conduct Brackets for routing bonding conductors outside of, yet parallel to ladder rack or basket tray.

I. Bonding conductor support systems like auxiliary brackets shall be spaced no further apart than three foot intervals.

J. All cables containing metallic shielding or armor shall be properly bonded into the communications grounding system using the appropriately sized grounding kit from an approved manufacturer.

3.05 BONDING WITHIN RACKS AND CABINETS

A. Racks and cabinets shall be bonded into the communications bonding network with conductors of #6 AWG or larger.

B. Depending on size of the telecommunications room, rack bonding conductors (RBC) may tap into underfloor or overhead grounding conductors, or for smaller TRs (3-5 racks or cabinets), may go directly from the rack to the wall mounted busbar.

C. Racks, cabinets and similar enclosures shall not be attached serially but must have individual RBC into the grounding system.

D. Newly installed racks and cabinets shall have vertical grounding busbars installed along one rail to provide clean bonding landing point for all rack mounted equipment. Grounding busbars shall not be isolated from the rack or cabinet.

E. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread-forming screws to ensure electrical continuity between the different structural components of the rack/cabinet.

F. Larger equipment with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack-mounted busbars.

G. Anywhere two metallic surfaces are to be bonded, contractor shall clean the contact areas of paint or oxidation using abrasive pads, and apply film of anti-oxidation compound between surfaces prior to bonding.

H. All cable fittings shall be of two-hole compression-type. Mechanical screw-lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.

I. All screws used to affix compression lugs to rack-mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.

J. Smaller equipment not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread-forming grounding screws with serrations under the head to cut through pain, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.

3.06 FIELD QUALITY CONTROL

A. On installations confined to a single telecommunications room, the installing contractor shall visually verify continuity of communications bonding system from equipment, through racking systems, to overhead underfloor backbone to the wall mounted busbar in that telecommunications room.

B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers and thread-forming grounding screws.

C. Installation of a building-wide telecommunications backbone, installing contractor is further responsible for visually verifying sizing and sound installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.

D. Inspecting contractor shall verify that any conduit larger than 3 feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.

E. During inspections contractor shall verify compliance with all stipulations specified in this document and compliance with all regulatory references cited.

F. All openings or gaps in the bonding system during inspections will be recorded in the inspection report and remedied.

G. During inspections, contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.

END OF SECTION 27 05 26

SECTION 27 05 28
PATHWAYS FOR COMMUNICATION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Termination backboards

1.02 RELATED SECTIONS

A. Specification Section 26 0529 - Hangers and Supports for Electrical Systems

B. Specification Section 26 0533 - Raceway And Boxes for Electrical Systems

C. Specification Section 27 0526 - Grounding and Bonding for Communications Systems

D. Specification Section 27 1005 - Telecommunications Cabling Infrastructure

1.03 REFERENCES

A. EIA/TIA-568B - Commercial Building Wiring Standard

B. EIA/TIA-569B - Commercial Building Standard for Telecommunication Pathways and Spaces

C. NFPA 70 - National Electrical Code

1.04 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years.
   3. Complete and in sufficient detail to allow ready determination of compliance with contract documents.
   4. Have options clearly indicated as applicable to each submittal.

B. Construction submittal
   1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Product Data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings. Include electrical characteristics and connection requirements.

1.05 SYSTEM DESCRIPTION

A. Pathway: Conform to EIA/TIA 569B, using raceway as indicated.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01 TERMINATION BACKBOARDS

A. Material: Plywood.

B. Size: 4' x 8', 3/4 inch thick.

C. Grade: Fire-retardant, AC grade with "C" grade applied to wall.

D. Painted on all sides and edges with fire resistant paint, (Sherwin Williams MIL-PRF-24596B).

E. Apply at location as shown on drawings.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Support raceways, backboards and cabinets.

B. Install termination backboards and cabinets plumb, and attach securely to building wall at each corner.

C. Install polyethylene pulling string in each empty conduit over ten feet (10') in length or containing a bend.

D. This contractor shall provide blank cover plates for all indicated telephone and computer outlets.

E. All conduit sizes shall be verified with the owner prior to installation.

F. Provide 1 inch conduit with box from each outlet location to above nearest accessible ceiling.

G. Conduit serving mechanical equipment low voltage cabling shall be 3/4" or larger.

H. Conduit serving category network cabling shall be 1" or larger.

I. Conduit serving audio visual system cabling shall be 1-1/4" or larger.

J. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Cablofil or Caddy Cable CAT. No cable shall be allowed to lie on accessible ceilings tiles.

K. Provide sleeves between walls and accessible clouds. Provide hooks with closure holes. Mount hooks 3 feet on center.

END OF SECTION 27 05 28

SECTION 27 10 05

TELECOMMUNICATIONS CABLING INFRASTRUCTURE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal copper

B. Patch panels

C. Optical fiber distribution panel

D. Work area outlets

E. Optical fiber connectors

F. Grounding and bonding products

G. Surge Protection

1.02 SUMMARY

A. Work included, but not limited to:
   1. Data network backbone cable installation
   2. Data network horizontal cable installation
   3. Data wiring closet setup
   4. Infrastructure cabling management
   5. Data patch cables
   6. Ground and bonding
   7. Testing requirements

1.03 GENERAL REQUIREMENTS

A. The drawings and specifications indicate the intent and direction of the installation. Items and their location are shown diagrammatic and are to be field verified by the cabling contractor prior to completing work associated with the item.

B. All cabling work shall be performed in strict accordance with all applicable laws, ordinances, codes of local, state and federal government, or other authorities having lawful jurisdiction. The cabling contractor is required to verify all requirements.

C. The cabling contractor shall furnish all required labor, material, and associated tools to facilitate the installation of all the infrastructure cables and associated items specified herein and with respect to the infrastructure design drawings without damage to the cables, associated items, and/or facilities.

D. Qualified personnel, utilizing state-of-the-art equipment and techniques shall complete all installation work.

E. All cables routed outside of the cable runway installed shall be properly supported.

F. All wall and/or floor penetrations shall be via metal conduit sleeves properly sized, supported and fire stopped.

G. All materials shall be installed in accordance with the manufacturer's specified recommendations and practices.

1.04 QUALITY ASSURANCE

A. Standards: All telecommunications wiring, cabling devices, and other associated items and work shall conform to the most recent requirements of the following codes, standards, and organizations where applicable:
   1. American National Standards Institute (ANSI)
   2. Electronic Industries Association (EIA)
   3. Federal Communications Commission (FCC)
   4. Institute of Electrical and Electronic Engineers (IEEE)
   5. International Organization for Standardization (ISO)
   6. National Electric Code (NEC)

7. National Fire Protection Association (NFPA)
8. BOCA National Building Code
9. Underwriter's Laboratories (UL)
10. Telecommunications Industry Association (TIA)
11. Building Industry Consulting Services International
12. Society of Cable Telecommunications Engineers (SCTE)

B. The copper data infrastructure cable system shall have a manufacturer's material and labor performance certification for the installed cable and components. The certification shall be that UTP Category 6A cabling infrastructure will perform to TIA's specifications for that Category. A manufacturer's written certification document shall be submitted at the completion of the project.

C. A matched solution shall be provided end-to-end for all cabling infrastructure. No third party components shall be provided unless otherwise noted elsewhere in the project specification or drawings.

D. The installer must be able to provide a warranty to the owner. Duration of the warranty shall be a minimum of ten years from the date of project completion and acceptance. It shall cover all of the product as well as their performance for the warranty period.

E. The cabling contractor shall be in business for a minimum of five (5) years.

F. The contractor must be registered with BICSI and have at least one Registered Communications Distribution Designer (RCDD) on full-time staff or be approved by the project engineer during the bidding process. Prospective contractors shall seek written approval from project engineer no later than seven days prior to bidding. Include in request to project engineer a list of full-time staff with certifications and references to three projects of similar size and scope in previous two years.

G. The contractor must possess current liability insurance certificates.

H. Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 30 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.05 SUBMITTALS

A. The cabling contractor shall not begin any installation of materials that require a material fact sheet and/or sample to be submitted and approved by the project engineer. If material is installed prior to approval, the bidder is liable for the cost of removal and replacement if the material is not approved.

B. All submitted documents shall be:
1. Digital (scanned documents are not acceptable)
2. Current, within last 5 years.
3. Complete and in sufficient detail to allow ready determination of compliance with contract documents.
4. Have options clearly indicated as applicable to each submittal.

C. Construction submittal
1. Provide (1) submittal including all products listed in this specification section and any other material not listed but required for proper installation. Provide the following for each product.
   a. Product Data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings. Include electrical characteristics and connection requirements.
   b. Installation Instructions indicating support and hanging details, and service clearances required.
   c. Certifications -
      1) Provide both the manufacturer's certification for all installers and technicians that will have a role in this project as well as all BICSI certifications as outlined in the sections above.

2) Provide Fluke or approved network cable tester calibration certification.

D. Closeout submittal
   1. After project substantial completion, provide (1) submittal including all products listed in this specification section. Provide the following for each product.
      a. Warranty documentation, fully filled out and including start-up and start date information.
      b. Test Results. A record of installed cable shall be provided in accordance with TIA/EIA-606. The cable records shall include only the required data fields in accordance with TIA/EIA-606. Include manufacture date of cable with submittal.
      c. Red Line Drawings - A completed set of drawings indicating the general cable routing of the backbone cables and the primary routes of the horizontal cables shall be provided. Also indicate all wall and floor sleeves utilized. The drawings for this information shall be a non-working, clean set of drawings. Handwritten drawings shall not be allowed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The cabling contractor shall coordinate all delivery, storage and handling concerns with the general contractor.

B. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

1.07 APPROVED CABLING VENDORS

A. All fiber and connectivity products provided by the structured cabling contractor shall be acomplete end-to-end system warrantied by the fiber manufacturer.

B. All category cable and connectivity products provided by the structured cabling contractor shallbe a complete end-to-end system warrantied by the cable manufacturer.

1.08 JACKET TYPE

A. As per NEC, this building is to have plenum-rated cable and products used exclusively. No “non-plenum” parts shall be installed.

1.09 COLORS

A. The owner shall determine all colors of cables, jack inserts, and other visible components during the submittal process from the standard colors available by each individual manufacturer. No custom colors will be used.

PART 2 PRODUCTS

2.01 HORIZONTAL COPPER

A. Category 6A Data and Voice:
   1. Provide unshielded Twisted Pair (UTP), Category 6A 4/pair, 23 AWG to locations identified on the plans.
      a. Commscope Systimax - GigaSPEED X10D
      b. No Engineer approved equal
      c. Cabling shall be also provided to each video surveillance camera and telephone entry system shown on the plans unless otherwise noted.
      d. Color to be determined by the owner.

B. Patch Cables - Data Racks (Copper):
   1. Provide pre-connectorized copper patch cables that match performance and configuration of horizontal data and voice cabling. Length as required for installation per BICSI standards.
   2. Quantity: Structured cabling subcontractor shall provide sufficient patch cords for 75% of horizontal cable runs. For bidding purposes, use an average cord length of 10 feet for patch cords.
   3. Color and exact length shall be determined by the owner.

C. Patch Cables - Workstations:

1. Match performance and configuration of horizontal data and voice cabling. Length as required for installation per BICSI standards
2. Quantity: Structured cabling subcontractor shall provide a workstation patch cord quantity equal to 50% of all wall-terminated data outlets. For bidding purposes, use an average cord length of 10 feet for patch cords. Patch cords shall be turned over to owner.
3. Color and exact length shall be determined by the owner.

2.02 PATCH PANELS

A. Data and Voice:
   1. Modular 24 or 48 position, 19 inch rack, 1U or 2U, UTP patch panel. Panel to meet performance standards of horizontal cabling manufacturer. Patch panel bracket shall accept RJ45 modular jacks that are utilized at the work area outlet.
      a. Product shall be a matched solution from cabling manufacturer
      b. Quantity as needed for all connections in contractor plus 25% at each rack for future growth.

2.03 OPTICAL FIBER DISTRIBUTION PANEL

A. Panel shall be a rack mounted optical fiber distribution panel constructed utilizing a minimum of 18 gauge steel. Panel shall be divided into two sections, distribution and user. Distribution section shall have strain relief, routing guides, splice tray and shall be lockable. The user section shall have a cover for patch cord protection. Each panel shall provide fusion spliced singlemode pigtails and adapters. Provide adapters as LC type.
   1. Product shall be a matched solution from cabling manufacturer.
   2. Mechanical terminated ends shall not be allowed.
   3. Provide quantity for 12 strands of fiber.

B. Provide pre-connectorized fiber patch cables with matching connectors as specified. Patch cords shall meet same performance requirements as backbone fiber optic cabling. Length as required for installation per BICSI standards.
   1. Product shall be a matched solution from cabling manufacturer.

2.04 WORK AREA OUTLETS

A. Work Area Data/Voice Jacks:
   1. Jacks shall be modular RJ-45 style and meet performance requirements of horizontal cabling.
      a. Product shall be a matched solution from cabling manufacturer.

B. Work Area Outlet Cover Plate:
   1. Telecommunications cover plates shall comply with TIA-568-C.1 and shall be oversized design constructed of stainless steel and match the style and color of receptacles and switch cover plates. Provide any blank inserts as required for all unused openings. Device cover plates shall be coordinated with architect during submittal review. Coordinate with each space prior to ordering.
      a. Product shall be a matched solution from cabling manufacturer.

2.05 OPTICAL FIBER CONNECTORS

A. Optical fiber connectors shall all be of the LC fusion splice pigtial style unless noted elsewhere.

2.06 GROUNDING AND BONDING PRODUCTS

A. Provide in accordance with UL 467, TIA J-STD-607, and NFPA 70. Components shall be identified as required by TIA/EIA-606. Provide ground rods, bonding conductors, and grounding busbars as specified in specification section 27 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

2.07 SURGE PROTECTION

A. Provide Ethernet surge protection systems for all externally mounted network connections (cameras).
   1. Externally mounted Ditek DTK-MRJPOEX

2. Internally mounted Ditek DTK-MRJPOE

PART 3 EXECUTION

3.01 GENERAL

A. The drawings and specifications are considered to reflect the intent and direction for a complete data cable system.

B. Quantities shown are for general information and may be incorrect. The bidder is to verify all quantities and is to report any count differences to the engineer prior to submission of their installation response. The cabling contractor will be held responsible for all required quantities to complete the project to the intent and direction of the drawings and specifications.

C. Material description and manufacturer's part numbers are shown. The cabling contractor is expected and has the responsibility to verify that the part number matches the description. Any discrepancy is to be noted to the engineer prior to response submittal. The cabling contractor is responsible for the correct materials being furnished and installed.

D. Install telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware in accordance with TIA-568-C.1, TIA-568-C.2, TIA-569, NFPA 70 and UL standards as applicable. Provide cabling in a star topology network. Pathways and outlet boxes shall be installed as specified in specification section 26. Install telecommunications cabling with copper media in accordance with the following criteria to avoid potential electromagnetic interference between power and telecommunications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the telecommunications cabling.

E. Install UTP telecommunications cabling system as detailed in TIA-568-C.1. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection tool kit for copper cable terminations. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable, bend radii shall not be less than four times the cable diameter. Cables shall all be terminated. There shall be no cable with unterminated elements. Cabling shall be continuous with no splices. Label cabling in accordance with paragraph titled LABELING.

F. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Cablofil or Caddy Cable CAT. No cable shall be allowed to lie on accessible ceilings tiles.

G. Provide sleeves between walls and accessible clouds. Provide hooks with closure holes and cable ties. Mount hooks 3 feet on center.

3.02 HORIZONTAL CABLING

A. Install horizontal cabling as indicated on drawings. Do not untwist Category 6/6A UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide slack cable in the form of a figure eight (not a service loop) on each end of the cable, 10 feet in the telecommunications room, and 12 inches in the work area outlet.

3.03 TELECOM ROOM CABLING

A. Neatly comb, bundle, and manage all cabling in groups of 24.

B. Provide appropriate accessories and transitions to manage cabling while maintaining manufacturer recommended bend radii and support with Velcro straps as necessary.

3.04 PATHWAYS

A. Provide in accordance with TIA-569 and NFPA 70. Provide building communications cabling pathway as specified in Section 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS and Section 27 0528 PATHWAYS FOR COMMUNICATION SYSTEMS.

3.05 WORK AREA OUTLETS

A. Terminate UTP cable in accordance with TIA-568-C, TIA-568-C.2 and wiring configuration as specified. All fiber optic cabling shall be terminated in accordance with TIA-568-C.3. Follow manufacturer's installation guidelines for all specific requirements related to work area outlet termination.

3.06 COVER PLATES

A. As a minimum, each outlet shall be labeled as to its function and a unique number to identify cable link in accordance with the section titled LABELING.

3.07 PULL CORDS

A. Pull cords shall be installed in conduit serving telecommunications outlets that do not have cable installed.

3.08 PATCH PANELS

A. Patch panels shall be mounted in equipment racks with sufficient ports to accommodate the installed cable plant plus 25 percent spares. Copper entering a patch panel shall be secured to the panel as recommended by the manufacturer to prevent movement of the cable.

3.09 EQUIPMENT RACKS, BRACKETS AND CABINETS

A. All equipment racks, brackets and cabinets hosting telecommunications equipment shall all be installed in accordance with the manufacturer's recommendations. Permanently anchor all racks to the floor.

3.10 GROUNDING AND BONDING

A. Provide in accordance with TIA J-STD-607, NFPA 70 and as specified in Section 26 0526 GROUNDING & BONDING FOR ELECTRICAL SYSTEMS.

3.11 LABELING

A. Provide labeling in accordance with TIA/EIA-606. Handwritten labeling is unacceptable. Stenciled lettering for voice and data circuits shall be provided using either thermal ink transfer or laser printing.

B. Cables shall be labeled using color labels on both ends with identifiers in accordance with TIA/EIA-606.

C. Workstation outlets and patch panel connections shall be labeled using color coded labels with identifiers in accordance with TIA/EIA-606.

3.12 CABLE TESTING

A. General: Cables are to be tested after installation is complete with Fluke DTX tester or equivalent and delivered in electronic format for engineer review. If for any reason, the drop location, raceway and/or drop location box is removed for additional work of any nature, the drop location is to be re-tested if previously tested. All cables associated with the drop location are to be re-tested. The cost of re-testing is the responsibility of the cabling contractor.
   1. The field-test instrument shall be within the calibration period recommended by the manufacturer, typically 12 months.

B. Category 6/6A Data - Unshielded Twisted Pair (UTP) Cable:
   1. Each UTP CAT 6 data cable installed shall be tested and a test result printout sheet shall be furnished at the completion of the project.
   2. The test shall be performed after the final cable and device termination has been completed and the faceplate installed. The test shall be of the “Basic Link” from completed end to completed end.

3. The test shall be conducted utilizing a scanner that will generate a sweet frequency 1-250 megahertz signal on all pairs of the cable and test each pair of the cable for:
    a. Pair mapping
    b. Cable length
    c. Insertion loss
    d. Near-End-Cross Talk (NEXT)
    e. Attenuation to Near-End-Cross Talk Ration (ACR)
    f. Return loss (RL)
    g. Power Sum Near-End-Cross Talk (PSNEXT)
    h. Power Sum Equal Level Far-End-Cross Talk (PSELFEXT)
    i. Far End Cross Talk (FEXT)
    j. Propogation Delay & Delay Skew
    k. Impedance
    l. Capacitance
    m. Resistance
4. Each data cable shall be tested to EIA/TIA-568, Category 6, compliance for acceptance.
5. Each test result shall indicate the cable number, test date and tester name. All test results are to be submitted to the project engineer in electronic format for review during closeout and final acceptance.
6. No hand written test results will be accepted by the project engineer.

3.13 EXTRA MATERIALS AND LABOR

A. This contractor shall include in their bid an allowance to install five (5) additional data outlets with an average length of 200 feet as directed by the project engineer at any time during the construction process. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

END OF SECTION 27 10 05

SECTION 27 11 16

COMMUNICATIONS RACKS, FRAMES AND ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted racks

B. Cable management

1.02 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of each rack.

1.03 GENERAL REQUIREMENTS

A. The drawings and specifications indicate the intent and direction of the installation. Items and their location are shown diagrammatic and are to be field verified by the contractor prior to completing work associated with the item.

B. All work shall be performed in strict accordance with all applicable laws, ordinances, codes of local, state and federal government, or other authorities having lawful jurisdiction. The contractor is required to verify all requirements.

C. The contractor shall furnish all required labor, material, and associated tools to facilitate the installation of all the equipment racks, cabinets, frames and associated items specified herein and with respect to the infrastructure design drawings without damage to the cables, associated items, and/or facilities.

D. Qualified personnel, utilizing state-of-the-art equipment and techniques shall complete all installation work.

E. All materials shall be installed in accordance with the manufacturer's specified recommendations and practices.

1.04 QUALITY ASSURANCE

A. Standards: All equipment, devices, and other associated items and work shall conform to the most recent requirements of the following codes, standards, and organizations where applicable:
   1. TIA - 569-B Commercial Building Standard for Telecommunications Pathways and Spaces
   2. ANSI/TIA - 568-C Commercial Building Telecommunications Cabling Standard
   3. ANSI/NECA/BICSI 568-2006 - Standard for Installing Commercial Building Telecommunications Cabling
   4. TIA - 606-A Administration Standard for Commercial Telecommunications Infrastructure
   5. ANSI-J-STD - 607-A Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   6. ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers
   7. NFPA 70 - National Electric Code

B. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.05 SUBMITTALS

A. The contractor is to provide material cut-sheet for all products listed in this specification, and any other material not listed but required for proper installation.

B. Provide both the manufacturer's certification for all installers and technicians that will have a role in this project

1.06 DELIVERY, STORAGE, AND HANDLING

A. The contractor shall coordinate all delivery, storage and handling concerns with the general contractor.

B. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for equipment placed in storage.

1.07 APPROVED EQUIPMENT VENDORS

A. All cabling and conductivity products provided by the structured cabling contractor shall be part of the following complete end-to-end systems:
   1. Chatsworth Products, Inc.
   2. Middle Atlantic Products
   3. Legrand
   4. Hoffman
   5. Great Lakes
   6. Panduit
   7. Engineer approved equal.

PART 2 PRODUCTS

2.01 WALL MOUNTED RACKS

A. Enclosed Lockable Wall Cabinet Description:
   1. Wall-mounted cabinets shall be manufactured from steel sheet.
   2. Each cabinet shall have a rear panel that attaches to the wall, a hinged cabinet body that swings open from the rear panel providing easy access to the rear of equipment and a locking front door.
   3. The rear panel shall be 5” (130 mm) deep and shall provide cable access with pre-punched knockouts for conduit along the top and bottom edges of the panel. There shall be a minimum of (4) combination 1/2” and 3/4” conduit knockouts (2 top/2 bottom) and (8) combination 2-1/2” and 3” knockouts (4 top/4 bottom). The back edge of the knockouts will be located 1-5/8” (41 mm) from the back surface of the panel (cabinet/wall) allowing conduit to be attached to the wall with auxiliary framing strut. The cabinet will include rubberized or plastic/composite grommets that fit within the 3” knockouts to protect cables when conduit is not used to route cables. There shall also be one 6” (150 mm) high by 6” (150 mm) wide cutout in the back of the rear panel so that cables can enter the panel through the wall. The rear panel shall provide attachment points for accessory equipment mounting brackets and cable tie points within the panel (cabinet). The manufacturer of the cabinet will sell compatible equipment mounting brackets and cable ties as separate accessories.
   4. The cabinet body shall include a single pair of vertical 19”EIA equipment mounting rails. The mounting rails shall be EIA-310-D compliant with the Universal hole pattern. Mounting holes shall be spaced vertically on alternating 5/8”-5/8”-1/2” (15.9 mm - 15.9 mm - 12.7 mm) centers and shall be roll-formed with #12-24 threads. Mounting rails shall provide 12, 18, or 26 rack-mount unit (U) spaces for equipment as specified below.
   5. Mounting rails shall be adjustable in depth so that they can be positioned at any point within the cabinet body. The design of all cabinets shall allow an additional pair of mounting rails (for a total of two pairs of mounting rails per cabinet) to be added to the cabinet. The manufacturer of the cabinet will sell compatible mounting rails as a separate accessory.
   6. Mounting rails shall bolt in place directly to the cabinet frame. The mounting rails shall be L-shaped. The side of the mounting rails will be punched to provide lacing points for cables.
   7. The hinge design that attaches the cabinet body and the rear panel shall allow the rear panel to be removed during installation.
   8. The hinge that attaches the cabinet body and the rear panel shall allow the cabinet body to open at least 90°. The hasp used to secure the rear panel and the cabinet body together shall assist in drawing the components together during the locking action.

9. The cabinet body shall include vents that are designed to accept fan kits. The manufacturer of the cabinet will sell compatible fan and filter kits as separate accessories.
10. The front door will be hinged and locking. The front door and rear panel will be keyed alike. The front door will have rounded edges and corners. The cabinet body will allow the front door to be attached so that it will swing open from the right or left. The front door will be solid or have a tinted window, as specified below.
11. Load bearing capacity for cabinets will be 200 pounds (90.7 kg) per cabinet. Load bearing capacity will be stated in the manufacturer's product literature.
12. Refer to the drawings for quantities.

B. Standard Swing Gate Wall Rack
1. Dual hinges open to right or left, stopping in 90° position
2. EIA-310-E compliant
3. Universal 5/8"-5/8"-1/2" (15.9 mm -15.9mm -12.7 mm) alternating hole pattern
4. Rack-mount spaces are marked and numbered
5. Includes (50) #12-24 mounting screws.
6. Supports 100 lb (45.4 kg) of equipment in the open and closed position when securely mounted
7. Load capacity can be increased to 150 lb (68 kg) with optional Heavy Duty Swing Gate Kit
8. Supports single-sided and double-side shelves
9. Refer to drawings for quantities.

C. Standard Swing Gate Wall Rack Approved Manufacturers
1. Chatsworth Products Inc #11790-718 (Black, 12 RU, 19"EIA, 18" Deep)
2. Engineer Approved equal

2.02 CABLE MANAGEMENT

A. Horizontal Cable Management for Racks/Frames
1. Place horizontal cable managers above and below each patch panel on/in each rack/frame/cabinet. The horizontal cable manager will guide patch/equipment cords between the vertical cable manager and individual network port connections.
2. The cable manager will be sized to match cabling requirements. Provide 1U of horizontal cable management for every 2U of connectivity. Cables must be able to access the cable manager so that no ports are blocked by the cables.
3. The manufacturer will state estimated cable fills for the cable manager in the product data sheet.
4. The horizontal cable manager will match the rack-mount width of the rack(s)/frame(s)/cabinet(s).
5. The horizontal manager will attach to the front or rear of the rack/frame/cabinet with screws and will be sized to fit within standard EIA-310-D rack mount spacing. The manufacturer of the horizontal cable manager will sell compatible racks/frames/cabinets.
6. The horizontal cable manager will be a single-sided C-shaped trough with a cover. The single-sided trough will have a slot or holes at the rear to facilitate front-to-rear cabling through the horizontal manager. The front of the cable manager will have T-shaped cable guides along the top and bottom surfaces of the cable manager. Evenly spaced cable openings in between the T-shaped cable guides allow cables to enter/exit the cable manager into the rack-mount space. The openings will have rounded edges to protect the cables. The cover will be removable, hinged to open up or down and will snap on to secure the cover in the closed position.
7. The horizontal cable manager shall be a matched solution from the rack/frame manufacturer and be manufactured from sheet aluminum and composite material.
8. Refer to drawings for quantities.

PART 3 EXECUTION

3.01 GENERAL

A. Cable Management

1. Attach vertical cable managers to the side of the rack/frame using the manufacturer's installation instructions and included hardware.
2. When a single vertical cable manager is used in between two racks/frames, attach the vertical cable manager to both racks/frames.
3. When more than one cable manager is used on a rack/frame or group of racks/frames, use the same make, style and size of vertical cable manager on the rack/frame or in between racks/frames.
4. The color of the rack(s)/frame(s) and cable manager(s) must match.
5. Door shall be attached to the cable manager and in the closed position after cabling is complete.

B. Wall-mounted cabinets and open frame swing racks
1. Provide all components of the cabinet/frame system (cabinet, mounting rails, cable managers, power strips, and accessories).
2. Attach the cabinet to the wall so that the front door and cabinet body can be opened fully without obstruction by other building, storage or architectural components. Follow the manufacturer's installation instructions when securing the cabinet to the wall and backboard. When not attached to the wall, the floor, shelf or tabletop surface on which the cabinet is placed must be able to hold the combined weight of the cabinet and the equipment within the cabinet. The cabinet should not be attached to sheet rock. The cabinet must be attached directly into studs through a ¾" plywood backboard. The cabinet may be attached to a masonry wall when the installer provides hardware. Use included hardware or the appropriate hardware as defined by local code or the authority having jurisdiction. The top of the cabinet when installed should not exceed 84" above the finished floor.
3. Cables shall enter/exit the cabinet through conduit knockouts in the top and/or bottom of the rear panel of the cabinet or through the rectangular cut out in the back of the rear panel of the cabinet. Use edge-protection grommets on conduit knockouts when cables pass through a conduit knockout but are not enclosed in conduit.
4. Install and adjust to position all accessories including power strips, equipment-mounting rails, fan and filter kits and lights, prior to installing equipment into the cabinet. Verify that fans, light and power strips work prior to installing equipment into the cabinet. Shelves, if used, may be installed with equipment.
5. Provide a telecommunications ground for equipment within the cabinet. Attach a 19" EIA busbar to the equipment mounting rails so that the mounting rails are bonded together. Attach a bonding conductor sized as defined in J-STD-607-A and as defined by local code or the authority having jurisdiction between the Telecommunications Grounding Busbar and the 19" EIA bus bar within the cabinet using two-hole compression lugs to connect the bonding conductor to each busbar. The installer will provide the 19" EIA bus bar, antioxidant compound, the bonding conductor and other necessary hardware required to make the connections between the cabinet and the Telecommunications Grounding Busbar.

END OF SECTION 27 11 16

SECTION 28 00 50

BASIC ELECTRONIC SAFETY AND SECURITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Electronic Safety and Security Requirements specifically applicable to Electrical Division Specification Sections.

B. Division 28 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

C. Division 28 Specification requirements also include, by reference, Specification Section 08 7100 - Door Hardware. Review and inclusion of the electrical requirements of this specification section are included as a part of this contract.

1.02 WORK BY OWNER

A. The Following Products Will Be Furnished By The Owner Bidding Contractor Shall Install:
   1. Security camera system shall be furnished by owner

B. Owner's Responsibility:
   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.

C. Contractor's Responsibility:
   1. Review owner reviewed shop drawings, product data and samples.
   2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
   3. Handle, store, install and finish products. Install electrical wiring and devices.
   4. Repair and/or replace items damaged after receipt.

1.03 OWNER OCCUPANCY

A. The owner will occupy the Operations Building premises during the construction period.

B. The owner will not occupy the Bus Barn premises during the construction period.

C. Limit use of site and premises to allow owner occupancy.

D. Cooperate with the owner to minimize conflict and to facilitate owner's operations.

E. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

A. This contractor shall give proper authorities all requisite notices relating to work in their charge, obtain official permits, licenses for temporary construction and pay proper fees for it.

B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by themselves, by their employees or through any operation under their charge, whether in the contract or extra work.

C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.

D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.

E. All work shall comply with the applicable recommendations of:

1. National Board of Fire Underwriters
2. ANSI-NFPA 70 National Electrical Code
3. National Fire Protection Association (NFPA)
4. Occupations Safety and Health Act (OSHA)
5. IBC Building Code (current) and any current applicable city building and or electrical codes.
6. Fire Protection: Conform to UFC and NFPA
7. The Joint Commission
8. Iowa Administrative Code, Chapter 61

F. Obtain permits and request inspections from authority having jurisdiction.

G. Conform to latest approved versions of codes.

1.05 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.

C. This contractor shall, before submitting their bid, visit the site of the project to familiarize themselves with locations and conditions affecting their work.

D. It is the intent of this specification that the contractor furnishes all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.

F. This contractor shall provide holes as necessary for the installation of their work and in accordance with materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

A. This contractor shall arrange their work in order that it progresses along with the general construction of the building.

B. This contractor shall be kept informed as to the work of other trades engaged in this project and shall execute their work in such a manner so as not to delay or interfere with progress of other contractors.

C. Where space for electrical lines and conduit is limited, it is imperative that all such trades coordinate their work so as to Ensure concealment in space provided. Where conflict exists, the design team shall decide priority of space. If work is not properly coordinated, the design team may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.

B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at their own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".

D. Similar products shall be all of the same manufacturer and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction the contractor shall check and verify with the owner each item of existing equipment that must be removed.

B. The owner will designate which items of material or equipment not reused that they may wish to keep. This contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for their use shall become the property of the contractor and shall be removed from the site.

1.10 PROTECTION AND MAINTENANCE

A. The work covered by these drawings and specifications involves all work in the new and existing building.

B. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.

C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.

D. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of their work.

E. Coordinate protection requirements with department heads before beginning construction.

F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 DEMOLITION

A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be reused".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.
   4. All elements to be removed are subject to the Owner's Right of Salvage.

B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.12 CUTTING AND PATCHING

A. This contractor shall do all cutting and patching necessary for the installation of their work in all existing and new buildings unless otherwise noted.

B. In areas where the integrity of fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.

C. This contractor shall do all cutting and patching required for their work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

A. This contractor, upon completion of their work, shall remove all rubbish and debris resulting from their operation and shall remove it from site at their own expense.

B. As far as their work is concerned, all equipment shall be cleaned and the premises left in first class condition.

C. This contractor shall maintain the work area each day to prevent hazardous accumulation of debris from their work.

1.14 SEALING AND PENETRATION

A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.

B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.

C. Manufacturer offering products to comply with the requirements include the following:
   1. Dow Corning "Silicone RTV Foam"
   2. 3-M Corporation "Fire Barrier Caulk and Putty"
   3. Thomas & Betts "Flame Safe Fire Stop System"

D. Installation of these products are to be in strict accordance with the manufacturer's recommendations and architectural specifications, details or equivalent fire stopping general specification section.

E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 HAZARDOUS MATERIALS

A. If this contractor stores any hazardous solvents or other materials on the site, they shall obtain copies of the safety data sheets for the materials and post them at the site. The contractor shall inform the owner and all employed of any potential exposure to this material.

B. At no time shall any product containing asbestos be incorporated into the work.
   1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.16 RECORD DRAWINGS

A. This contractor shall provide (at the conclusion of the project) one clean, non-torn, neat and legible "as-built" set of drawings to the owner. These drawings shall show the routing of conduit, wiring and equipment drawn in at scaled locations. All cabling, devices, and endpoints shall be labeled and conform to head end programming and system drawings. All dimensions indicated shall be referenced to a column line. A set of construction blueprints will be furnished for this work.

B. All electrical panels and electrical installed equipment shall be shown on the "as-built" drawings.

C. Refer to Architectural Specification Sections for additional requirements.

D. This contractor shall update these drawings during the project at least every week.

1.17 ALTERNATES

A. Refer to description of alternate bids under General Specification Sections.

1.18 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels they propose to furnish. The brochure shall contain complete information as to the model of equipment, type, size, capacities, dimensions, and illustration. An electronic copy shall be kept on the job at all times.

B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless the contractor notifies engineer, in writing, of such deviation at time such drawings are furnished.

C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.

D. This contractor shall mark the date and sign each set signifying that the contractor has checked that each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.19 TEST OF SYSTEMS

A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.

B. This contractor shall be held responsible for all damage resulting from defects in the system.

C. Each individual feeder circuit shall be tested at the panel and in testing for insulation resistance to ground; the power equipment shall be connected for proper operation. In no case shall the insulation resistance to ground be less than that required by the National Electrical Code (NEC).

1.20 SCOPE OF WORK

A. This contractor shall furnish all the labor and material to install a complete safety and security system in the new building. The system shall include all items of work as outlined in these specifications and on the drawings.

B. All work shall be performed by a well-qualified and licensed technician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that their electricians are familiar with all the various codes and tests applicable to this work.

C. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.

D. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.

E. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.

F. This contractor, shall before proceeding with any work, review the architectural drawings. Any conflict between the technology and architectural drawings shall be reported to the engineer for clarification.

G. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

H. The Safety and Security Contractor shall establish system elevations prior to fabrication and installation. The Safety and Security Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
   1. Lighting Fixtures
   2. Gravity flow piping, including steam and condensate.
   3. Electrical bus duct.
   4. Sheet metal.
   5. Cable trays, including access space.
   6. Other piping.
   7. Conduits and wireway.

I. Low Voltage Cable Installation
   1. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Cablofil or Caddy Cable CAT. No cable shall be allowed to lie on accessible ceilings tiles. Provide sleeves between walls and accessible clouds. Provide hooks with closure holes and cable ties. Mount hooks 3 feet on center.

1.21 TRENCHING AND BACKFILLING

A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.

B. All underground utilities, telephone conduit, parking lot lighting, tunnels, etc shall be exactly located prior to digging. This contractor shall be held responsible for all damages caused by failure to do so.

C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.

D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.

E. Refer to architectural specification sections for additional information.

1.22 DAILY HOUSEKEEPING AND CLEANING

A. At the end of each workday, the contractor shall remove all of their debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor, for the removal of debris from the project, shall not use the owner's waste disposal facility.

B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.23 WALL CONTINUITY (1 HR.)

A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.

B. Any branch panel in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.24 CABLE

A. The fire alarm system manufacturer shall approve low voltage cable. All low voltage electrical cable, installed as part of a new fire alarm system, shall be plenum rated cable.

B. Cable installed without using raceway shall be neatly routed and supported every 3 feet by no less than a nylon wire tie or supported in bridle rings. All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceways. No cable shall be allowed to lie on the accessible ceiling tile.

1.25 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) Documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.26 SECURE NETWORKABLE DEVICES

A. Update network devices to the most current software/firmware.

B. Change default password of all networkable devices.
   1. Passwords shall have at least eight characters.
   2. Include uppercase and lowercase letters, numerals, and special characters

C. Supply MAC address and serial number of all networkable devices.

D. Work with the Owner's IT department to align to existing IT standards.

E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.27 SYSTEM CONFIGURATION AND PROGRAMMING FILES

A. Supply system configuration and programming files where export is available.

B. Supply uncompiled programming for systems applicable.

C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 28 00 50

SECTION 28 00 90

MINOR ELECTRONIC SAFETY AND SECURITY DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 26 0050 - Basic Electrical Requirements "General Provisions" apply to this section.

1.02 SCOPE

A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
   1. Elements shown on the drawings as "existing to remain and/or to be relocated".
   2. Elements serving adjacent areas.
   3. Elements required for the support of the newly remodeled areas.

B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.

C. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.

D. This contractor shall remove all abandoned equipment, conduit, and supports associated with the remodeled area unless noted otherwise.

E. This contractor is responsible to provide temporary electronic safety and security protection during this project.

1.03 MATERIALS

A. All elements to be removed are subject to the Owner's Right of Salvage.

B. All materials removed shall be the property of the removing contractor and shall be removed from the site by them, unless otherwise specified.

C. The owner may designate and have salvage rights to any material herein demolished by this contractor. It will be the owner's responsibility to designate such salvageable items and remove them prior to the contractor working in that area.

1.04 EXISTING CONDITIONS

A. If any existing devices that are to remain are disturbed by operations under this contract, the contractor is required to re-establish continuity of such systems.

B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to removal of equipment and conduit.

C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. **Beginning of demolition means installer accepts existing conditions.**

B. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing the existing installation.

C. Verify field-circuiting arrangements and reconnect as necessary.

D. Verify that abandoned wiring and devices serve only abandoned facilities. Reconnect circuits, as required, to prevent de-energizing of remaining receptacles of lights.

3.02 PREPARATION

A. Disconnect safety & security in walls, floors, and ceilings scheduled for removal.

B. Coordinate service outage with local utility company, inspectors, owners, and design team.

C. Provide temporary wiring and connections to maintain existing systems in service during construction.

D. Existing safety and security services: Maintain existing system in service until new systems are complete and ready for deployment. Disable systems only to make switchover connections. Obtain permission from the owner, at least 1 week before partially or completely disabling any system. To minimize outage, duration, make temporary connections as required.

E. Existing Telephone system: maintain existing system in service.

F. Existing Building Security System, Video Surveillance, Door Access, and Fire Alarm Systems:
   1. Maintain existing system in service until new systems are accepted.
   2. Disable system only to make switch over and connections
   3. Obtain permission from the owner at least 24 hours before partially or completely disabling system.
   4. Minimize outage duration.
   5. Make temporary connections to maintain service in areas adjacent to work areas.

3.03 DEMOLITION AND EXTENSION OF EXISTING SAFETY AND SECURITY

A. Demolish and extend existing safety and security work under provisions of this section.

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 cable and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide a blank cove for abandoned devices that have not been removed.

F. Disconnect and remove abandoned control panels and head end equipment.

G. Disconnect and remove devices and equipment service abandoned safety and security system.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing safety and security installations that remain active. Modify installation or provide access panel as appropriate.

J. Extend existing installation using materials and methods compatible with existing electrical installations or as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials that remain or are to be reused.

B. Control Panels: Clean exposed surfaces and check tightness of all connections. replace damaged items and equipment. Provide typed directory showing revised changes or programming.

3.05 INSTALLATION

A. Install relocated materials and equipment.

END OF SECTION 28 00 90

SECTION 28 13 00
ACCESS CONTROL SYSTEM (EXISTING)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system field hardware

B. Electrical power requirements

1.02 RELATED SECTIONS

A. Specification Section 08 7100 - Door Hardware

B. Specification Section 26 0433 - Raceways and Boxes for Electrical Systems

C. Specification Section 26 0519 - Electrical Power Conductors and Cables for Electrical Systems

D. Specification Section 26 0526 - Grounding and Bonding for Electrical Systems

1.03 REFERENCES

A. ADA - Accessibility Guidelines for Buildings and Facilities

B. NFPA 70 - National Electrical Code

C. NFPA 72 - National Fire Alarm and Signaling Code

D. IBC International Building Code

1.04 SUMMARY

A. Contractor shall provide and install a complete, access controller head end components for connection to existing district wide cloud based Verkada security system. System shall include all key central components for managing physical security and the bridge between physical and logical security. The system shall provide a variety of integral functions including: regulation of access and egress; provision of identification of credentials; monitor, track and interface alarms and; view, record and store digital surveillance video linked to the system's events

B. System shall be fully integrated with Verkada video security matching entry events with associated camera locations.

C. The system shall pull from existing cloud database of credentialed users for all access control functions. Existing school credentials shall be usable on all new openings without the issuance of new cards.

D. System shall have they ability to work with Verkada Pass app for door and camera control.

E. System shall include a long range RFID security system for gate control.

1.05 GENERAL REQUIREMENTS

A. The drawings and specifications indicate the intent and direction of the installation. Items and their location are shown diagrammatic and are to be field verified by the contractor prior to completing work associated with the item.

B. All work shall be performed in strict accordance with all applicable laws, ordinances, codes of local, state and federal government, or other authorities having lawful jurisdiction. The contractor is required to verify all requirements.

C. The contractor shall furnish all required labor, material, and associated tools to facilitate the installation of all the audio and video equipment associated items specified herein and with respect to the design drawings without damage to the cables, associated items, and/or facilities.

D. Qualified personnel, utilizing state-of-the-art equipment and techniques shall complete all installation work.

E. All materials shall be installed in accordance with the manufacturer's specified recommendations and practices.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings.
   1. Manufacturer's technical data for all material and equipment at the system and sub system level to be provided as part of the ACS.

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work.
   1. Indicate all system device locations on architectural floor plans. No other system(s) shall be included on these plans.
   2. Include full schematic wiring information on these drawings for all devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at device.
   3. Include final door frame rough-in drawing for individual door openings.
   4. Include a complete ACS one-line, block diagram.
   5. Include a statement of the system sequence of operation.

1.07 CLOSE OUT DOCUMENTS

A. Operation and Maintenance Data new/updated devices: For electronic security system emergency, operation, and maintenance manuals.
   1. Provide one (1) set electronic format manuals including operating instructions, maintenance recommendations and parts list including wiring and connection diagrams modified to reflect as-built conditions.
   2. Manuals: Deliver final copies of the manuals within thirty (30) days after completing the installation test.
   3. The basics of the manuals shall include the following:
      a. The contents of the manual identified on the cover.
      b. Include names, addresses, and telephone numbers of the Contractor responsible for the installation and maintenance of the system and the factory representatives for each item of equipment for the system.
      c. The manuals shall have a table of contents and labeled sections. The final copies delivered after completion of the installation test shall include all modifications made during installation, checkout, and acceptance testing.
   4. There shall be a set of Functional, Hardware, Cybersecurity Hardening Guide and Software manuals.
   5. The functional manual shall identify the operational requirements for the system and explain the theory of operations, design philosophy, and specific functions. Include a description of hardware and software functions, interfaces, and requirements.
   6. The hardware manual shall describe the equipment furnished including:
      a. General description and specifications
      b. Installation and check out procedures
      c. Equipment layout and electrical schematics to the component level
      d. Alignment and calibration procedures
      e. Manufacturer’s repair parts list indicating sources of supply.
   7. The software manual shall describe the functions of software and include all other information necessary to enable proper loading, testing, and operation. This manual shall include:
      a. Definition of terms and functions.
      b. System use and application software.
      c. Initialization, startup, and exit.
      d. Reports generation.
      e. Details on forms customization and field parameters.
   8. As-Built Drawings: During system installation, the Contractor shall maintain a separate hard copy set of drawings and wiring diagrams of the ACS to be used for record drawings. This set shall be accurately kept up to date by the Contractor with all changes and

additions to the ACS. Copies of the final as-built drawings shall be provided to the end user in an acceptable AutoCAD (DWG/DXF) format.

a. Updated Passwords, IP address MAC addresses programming operation check list.
b. Door operation checklist confirming all door operate per owner requirements and 08 7100 specifications.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. ACS manufacturer shall be an established organization with referenced and documented experience delivering and maintaining SMS of equal or higher sophistication and complexity as compared to the system detailed in this specification.
   2. ACS manufacturer shall employ at a minimum the following methods for quality assurance of component and assembly devices.
      a. Perform visual inspection of devices to verify assembly according to defined procedures. Perform end of line operational tests to ensure product functionality has been correctly configured.
   3. Perform individual functionality and system level regression testing to ensure compliance with product specifications. Perform single and multiple unit system tests to mimic end-user installation configurations. Utilize automated hardware and software testing to evaluate system performance under published operational loads and compare to published system capabilities.

B. Bidder Qualifications:
   1. At the time of the bid, the bidder shall have satisfactorily completed projects of a similar size, scope, and complexity as the system detailed in this specification. The bidder shall furnish written proof of experience from three (3) references and proof of current accreditation or certification by the manufacturer for required training for sales or installation or service of the ACS and associated devices.
   2. The bidder shall also be a factory authorized local service organization that shall carry a complete stock of parts and provide maintenance for the SMS and related systems under this contract. Local shall be defined as an area in a 125 mile radius of the installed location.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Match existing Verkada hardware

B. No Engineer approved equal.

2.02 ACCESS CONTROL SYSTEM FIELD HARDWARE

A. Access Control System (ACS) Hardware: The ACS shall be equipped with the access control field hardware required to receive alarms and administer all access granted or denied decisions. This shall include but not be limited to: intelligent system controllers (ISC), reader controllers and general purpose input/output panels. All field hardware must be designed to meet UL 294 requirements. The ACS must be able to retrieve device serial numbers from all field hardware, excluding card readers, biometric readers, and keypads.

B. ACS Authentication Hardware:
   1. Contactless smartcard reader – multi-technology, mobile ready standalone credential readers:
      a. HID® Signo Reader 20 Mullion Mounted
      b. HID® Signo Reader 40 Single gang mounted
      c. Refer to drawings and locations and quantities.

C. RFID Long Range Vehicle and Driver Identification:
   1. Provide Nedap Transit Ultimate RFID system. Include all parts and pieces to make a complete and working system.
      a. Submit for Engineer approved equal.
   2. Provide 94 vehicle identification tags.

2.03 ELECTRICAL POWER REQUIREMENTS

A. System Power: The security management system shall operate using standard 120 volts AC power.

B. Battery Backup: A rechargeable 12VDC, gel-type, lead acid battery backup shall be provided for all intelligent system controllers, reader controllers, and general purpose input/output panels.

C. Provide a centralized power supply for all electronic locking hardware with the exception of all electrified panic bar locations. Coordinate power supply quantities with division 08 7100.
   1. Altronix
   2. Engineer approved equal.

2.04 FIELD HARDWARE

A. Door Status Switch (DC):
   1. George Risk Industries (GRI) model 8080-TWG-B
   2. George Risk Industries (GRI) model 7623-TWG-G
   3. George Risk Industries (GRI) model 200-36
   4. Engineer approved equal

B. Request To Exit Devices (RTE/ALM):
   1. Kantech model TREX-XL
   2. Kantech model TREX-XL2
   3. Engineer approved equal

C. Overhead Door Position Switch
   1. GRI 4700-A
   2. Engineer Approved Equal

PART 3 EXECUTION

3.01 EXAMINATION

A. Submittals for review by design team confirms that the contract documents and site conditions are accepted without qualifications unless exceptions are specifically noted.

B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contracts, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.

C. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of electronic security system.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SYSTEM INTEGRATION

A. Integrate electronic security system with the following systems and equipment:
   1. Electronic door hardware
   2. Fire Alarm
   3. Video Surveillance

3.03 INSTALLATION

A. Install system in accordance with manufacturer's installation instructions. The following conditions are applicable:
   1. In order to ensure a complete, functional system, for bidding purposes, where information is not available from the owner upon request, the worst-case condition shall be assumed.
   2. Interfaces shall be coordinated with the owner's representative, where appropriate.
   3. All necessary back boxes, pull boxes, connectors, supports, conduit, cable and wire shall be furnished and installed to provide a complete and reliable system installation. Exact location of all devices and wiring shall be presented to the owner for approval in advance of any installation.

B. The contractor shall install all system components and appurtenances in accordance with the manufacturer's instructions, and shall furnish all necessary interconnections, services, and

adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation. Provide mounting hardware as required.

C. Technicians shall be certified by the manufacturer for the version of the product in place.

D. All inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors which serve as communications circuits from security console to field equipment, and between field equipment, shall have surge protection circuits installed at each end.

E. Connect each field device with owner's data network as required. Coordinate each connection type and requirement with structured cabling contractor.

F. Wiring Method: Install wiring in metal raceways, except in accessible spaces and in interior hollow gypsum board partitions where cable may be used. Minimum conduit size shall be 1/2-inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

3.04 CABLE

A. The access control system manufacturer shall approve and install the low voltage cable. All low voltage electrical cable that is installed as part of the access control system shall be plenum rated cable where required.
   1. Contractor shall provide a composite security cable where applicable.

3.05 TESTING AND CERTIFICATION

A. This contractor shall demonstrate the functionality of the system, as defined by the matrix of responsibility on the plans and section 08 7100, upon completion of installation, documenting the result of all tests and providing these results to the owner. The system shall be tested in accordance with the following:
   1. This contractor shall conduct a complete inspection and test of all installed equipment. This includes testing and verifying connection to equipment of other divisions.
   2. This contractor shall provide staff to test all devices and all operational features of the system for witness by the owner's representative. The contractor shall provide two-way radio communications to assist in the testing. The owner's representative, prior to acceptance, must witness all testing.

B. The testing and certification shall take place as follows:
   1. System shall be tested in conjunction with the manufacturer's representative.
   2. All deficiencies noted in the above test shall be corrected.
   3. Test results shall be submitted to the consultant or owner's representative.
   4. System test witnessed by owner's representative and correction of any deficiencies noted.
   5. The owner's representative shall accept the system.
   6. A letter of certification shall be provided to indicate that the tests have been performed and all devices are operational.

3.06 FIELD QUALITY CONTROL

A. Test in accordance with NFPA 72.

3.07 WARRANTY

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished, and labor installed under this contract for a period of one year after date of final acceptance.

3.08 WARRANTY

A. This contractor shall guarantee all of the apparatus, materials, equipment furnished, and labor installed under this contract for a period of one year after date of final acceptance.

3.09 MANUFACTURER'S LICENSING CONTRACT

A. This contractor shall update and maintain all system licensing of the installed hardware under this contract for a period of 1 years after date of final acceptance.

B. Contractor shall work with owner providing a yearly cost of any Software Subscription Agreement SSA associated with the licensing of the software.

END OF SECTION 28 13 00

SECTION 28 23 00

VIDEO SURVEILLANCE (EXISTING)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ethernet network

1.02 RELATED SECTIONS

A. Specification Section 26 0533 - Raceway and Boxes for Electrical Systems

B. Specification Section 28 1300 - Access Control

1.03 REFERENCES

A. NPFA 70 - National Electrical Code.

1.04 SYSTEM DESCRIPTION

A. The Digital Video Management Solution (DVMS) shall be the owner's existing cloud based, Verkada solution with software designed for scalable installations that may consist of multiple sites.

B. The software solution shall allow an unlimited number of cameras to be connected when used with client software.

1.05 GENERAL REQUIREMENTS

A. The drawings and specifications indicate the intent and direction of the installation. Items and their location are shown diagrammatic and are to be field verified by the contractor prior to completing work associated with the item.

B. All work shall be performed in strict accordance with all applicable laws, ordinances, codes of local, state and federal government, or other authorities having lawful jurisdiction. The contractor is required to verify all requirements.

C. The contractor shall furnish all required labor, material, and associated tools to facilitate the installation of all the audio and video equipment associated items specified herein and with respect to the design drawings without damage to the cables, associated items, and/or facilities.

D. Qualified personnel, utilizing state-of-the-art equipment and techniques shall complete all installation work.

E. All materials shall be installed in accordance with the manufacturer's specified recommendations and practices.

F. Access control and camera control shall be integrated together in that an action in the accesscontrol system will trigger camera recording and notification of event.

1.06 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.

B. Product Data: Provide showing electrical characteristics and connection requirements for each component.

C. 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.

D. Calculations for days of retention at a level of resolution.

E. Programming and any special features for this project, i.e. mapping.

F. Information regarding accessories providing ties to other systems.

1.07 PROJECT RECORD DOCUMENTS

A. Record the actual locations and routing of cameras and cabling.

B. Record Patch Panel port, and network port of camera and cabling.

C. Record IP address, Mac Address, and camera log on information.

D. Record and turn a copy over to owner of DVMS configuration files, log in information, and system documentation.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience and with service facilities within 100 miles of project.

B. Supplier: Authorized distributor of specified manufacturer with three years (minimum) experience.

1.09 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of DVMS system for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ETHERNET NETWORK

A. Owner provided network
   1. Owner's contractor shall terminate category cabling on a biscuit jack above nearest accessible ceiling to a POE network switch in the telecom room. Security cameras shall be installed and connected by security contractor. Allow for a 20ft service loop at accessible ceilings. Exposed locations shall be concealed and service loop shall be at the closet locations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install system in accordance with manufacturer's installation instructions. The following conditions are applicable:
   1. In order to ensure a complete, functional system, for bidding purposes, where information is not available from the owner upon request, the worst-case condition shall be assumed.
   2. Interfaces shall be coordinated with the owner's representative, where appropriate.
   3. All necessary back boxes, pull boxes, connectors, supports, conduit, cable and wire shall be furnished and installed to provide a complete and reliable system installation. Exact location of all devices and wiring shall be presented to the owner for approval in advance of any installation.

B. The contractor shall install all system components and accessories in accordance with the manufacturer's instructions, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation. Provide mounting hardware as required.

C. All inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors and as shown. All communications equipment shall be protected against surged induced on any communications circuit. All cables and conductors which serve as communications circuits from head end to field equipment, and between field equipment, shall have surge protection circuits installed at each end.

D. Connect each field device with owner's data network as required. Coordinate each connection type and requirement with structured cabling contractor.

E. Wiring Method: Install wiring in metal raceways, except in accessible spaces and in interior hollow gypsum board partitions where cable may be used. Minimum conduit size shall be 1-inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Interface installation of DVMS with security access and intrusion detection systems.

3.03 ADJUSTING

A. All camera's will be in focus and iris adjusted to meet lighting conditions.

B. All camera views will be coordinated and approved by owner.

C. Screen capture from camera.

3.04 TESTING AND CERTIFICATION

A. This contractor shall demonstrate the functionality of the system upon completion of installation, documenting the result of all tests and providing these results to the owner. The system shall be tested in accordance with the following:
   1. This contractor shall conduct a complete inspection and test of all installed equipment. This includes testing and verifying connection to equipment of other divisions.
   2. This contractor shall provide staff to test all devices and all operational features of the system for witness by the owner's representative and the authority having jurisdiction. The contractor shall provide two-way radio communications to assist in the testing. The owner's representative, prior to acceptance, must witness all testing.

B. The testing and certification shall take place as follows:
   1. System shall be tested in conjunction with the manufacturer's representative.
   2. All deficiencies noted in the above test shall be corrected.
   3. Test results shall be submitted to the consultant or owner's representative.
   4. System test witnessed by owner's representative and correction of any deficiencies noted.
   5. The owner's representative shall accept the system.
   6. System test shall be witnessed by the authority having jurisdiction, and any deficiencies that are noted shall be corrected.
   7. A letter of certification shall be provided to indicate that the tests have been performed and all devices are operational.

END OF SECTION 28 23 00

SECTION 28 31 00

FIRE DETECTION AND ALARM (ADDRESSABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm and smoke detection control panel

B. Peripheral devices

C. Fire alarm wire and cable

D. Sprinkler flow and tamper switch

E. Remote alarm annunciator panel

F. Cellular communicator

1.02 RELATED SECTIONS

A. Section 08 7100 - Door Hardware

B. Section 21 1300 - Fire Suppression Sprinkler System

C. Section 21 2000 - Fire Extinguishing System

D. Section 26 0533 - Raceways and Boxes for Electrical Systems

1.03 REFERENCES

A. NFPA 70 - National Electrical Code

B. NFPA 72 - National Fire Alarm Code

C. NFPA 101 - Life Safety Code

D. International Building Code

E. International Fire Code

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems

1.04 SYSTEM DESCRIPTION

A. Provide and install a manual and automatic fire alarm system that shall meet or exceed current IBC/IFC code requirements in accordance with NFPA 72.

B. Fire alarm system shall include the system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm and supervisory signal initiating devices, alarm notification appliances and other accessories required for a complete operating system.

1.05 SUBMITTALS

A. Shop Drawings: Provide a scaled building layout showing each device and wiring connection required.

B. Product Data: Provide electrical characteristics and connection requirements.

C. Test Reports: Indicate satisfactory completion of required tests and inspections.

D. 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 products.

E. Contractor shall submit software logic, flow diagrams, battery calculations and one line diagrams illustrating device loops.

F. Contractor shall be responsible for submitting a copy of these documents to the local Authority having jurisdiction or state for required review.

G. Submit copies of NICET certifications as described in this specification section.

1.06 PROJECT RECORD DOCUMENTS

A. Record actual locations of all initiating devices, signaling appliances, shut down relays, power supplies, and end-of-line devices. Illustrate each SLC loop that is planned.

B. Indicate device addresses on the drawings.

C. Deliver to owner as both hard copy and electronic file.

1.07 OPERATION AND MAINTENANCE DATA

A. Operation Data: Operating instructions.

B. Maintenance Data: Maintenance and repair procedures.

C. Configuration Data: Printouts of configuration settings for all devices.

D. Routine Maintenance Checklist.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum ten years experience.

B. The contractor shall have a fully equipped, factory trained, and manufacturer certified service and installation organization.
   1. Approved Contractor: American Alarms, contact Matt Davidson email mdavidson@american-alarms.com phone (515) 266-9888.
   2. No Engineer Approved Equal

C. Supervisor: The job supervisor shall be a NICET Level II (or higher) technician and be a full-time employee of the certified reseller. Supervisor shall be responsible for programming and testing.

D. Technician: A fire alarm technician shall have a minimum of four years experience terminating and installing fire alarm systems. The technician shall also be factory trained in the installation, adjustment, testing and operation of the equipment specified. The technician shall be capable of answering trouble calls from a permanently maintained location less than 100 miles from project site.

E. Installer: The installer shall be a company specializing in installing the products specified in this section with minimum three years experience, a NICET certified installer and/or licensed electrician shall be allowed to install wire, cable, conduit and back boxes for the fire alarm system.

F. A list of technicians with any level of responsibility with this project shall be submitted for review and acceptance during the submittal process. A copy of their NICET Certification(s) shall be included.

1.09 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 72 and NFPA 101.

B. Furnish products listed and classified by UL, FM approved for purpose specified and indicated.

1.10 MAINTENANCE SERVICE

A. A maintenance program shall be offered to the owner at the end of the warranted period to meet NFPA requirements.

1.11 EXTRA MATERIALS AND LABOR

A. Provide 1 installed automatic smoke detectors including 40 feet of wiring each per device to be positioned by the owner or engineer.

B. Provide 1 installed automatic heat detectors including 40 feet of wiring each per device to be positioned by the owner or engineer.

C. Provide 1 installed audible/visual alarms including 40 feet of wiring each per device to be positioned by the owner or engineer.

D. Provide1 installed visual alarms including 40 feet of wiring each per device to be positioned by the owner or engineer.

E. Provide a minimum of six keys of each type.

F. Devices shall be installed at the direction of the owner or design team.

G. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Potter

B. No engineer approved equal.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

A. The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system controlled devices.

B. The Notifier Potter IPA 60 control panel shall be the basis of design.

C. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
   1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
   2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
   3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.
   4. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.
   5. When a fire alarm, trouble or supervisory condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
      a. The system alarm LED shall flash.
      b. A local piezoelectric audible device in the control panel shall sound a distinctive signal.
      c. The 640-character backlit LCD display shall indicate all information associated with the condition, including the type of alarm point and its location within the protected premises.
      d. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

D. The control panel shall be capable of expansion via up to 1 SLC modules. Each module shall support a maximum of 50 analog/addressable devices for a maximum system capacity of 50 points. The system shall be capable of 8 annunciator points per system regardless of the number of addressable devices.

E. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company.

F. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

G. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.

H. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

I. Communicator:
   1. Universal Digital Alarm Communicator Transmitter
      a. The UDACT-2 is capable of transmitting the status of software zones (Alarm and Trouble), System Trouble, Panel Off-Normal, Supervisory, Bell Trouble, Low Battery, and AC Fail.
      b. Dual phone lines with line voltage detect.

2.03 PERIPHERAL DEVICES

A. Fire Sensors:
   1. All fire sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change.
   2. Each sensor shall have the capability to be tested for alarm from the sensor location.
   3. Each sensor shall be capable of being tested for alarm via command from the transponder.
   4. Each sensor shall respond to transponder scan for information with its type identification to preclude inadvertent substitution of another sensor type.
   5. The transponder shall operate with the installed type but shall initiate mismatch (trouble) condition until the proper type is installed or programmed sensor type changed.
   6. Each sensor shall respond to transponder scan for information. Such response proves end-to-end sensor response including the operation of the sensor electronics.
   7. Provide an addressable relay to control a 110-volt solenoid valve, which holds water off. See detail on the drawings. This is for sprinkler flow switches at elevator.

B. Manual Fire Alarm Stations:
   1. Design based on Notifier NOT-BG12LX or equal.
   2. Fire alarm pull station with red Lexan body, semi-flush mounted.

C. Automatic Smoke Detectors:
   1. Design based on Notifier NP-200 or equal.
   2. Photo-electric smoke sensors.

D. Photoelectric Smoke Detector with low frequency sounder base:
   1. Design based on Notifier #NH-200 with base Notifier B200S.
   2. Contractor shall coordinate colors with design team.

E. Thermo-Detectors:
   1. Design based on Notifier NH-100 or equal.
   2. Area thermo-detectors shall be 135 degree rat-of-rise fixed type and shall cover 2500 sq. ft.

F. Monitor Modules:
   1. Design based on Notifier NMM-100P or equal.
   2. The monitor module shall provide an addressable input for N.O. or N.C. contact devices such as manual stations, water flow switches, sprinkler supervisory devices, etc.
   3. The monitor module shall provide a supervised initiating circuit. An open circuit fault shall be annunciated at the transponder. Subsequent alarms shall be reported.

G. Relay Modules:
   1. Design based on Notifier NC-100R.

2. The control module shall provide an addressable output for a separately powered alarm indicating circuit for a control relay.
3. The control module shall provide a supervised indication circuit where indicated on the drawings. An open circuit fault shall be annunciated at the transponder. Subsequent alarm signaling shall occur in spite of the fault condition.

H. Horn/Strobe Indicators:
1. Design based on Notifier P(A)2(B)L or equal.
   a. P2RL - Wall mount, red.
   b. P2WL - Wall mount, white.
   c. PC2RL - Ceiling mount, red.
   d. PC2WL - Ceiling mount, white
   e. PC2RHL - Ceiling mount, red, high candela
   f. PC3WHL - Ceiling mount, white, high candela
2. Contractor shall coordinate color with design team.
3. Mounted to comply with Americans with Disabilities Act.
4. Flush mounted unit shall have thermoplastic faceplate, trim shall have the word FIRE.
5. Visual Alarm Light: Xenon Light.

I. Strobes:
1. Design based on Notifier S(A)R(B) or equal.
   a. SRL - Wall mount, red.
   b. SWL - Wall mount, white.
   c. SCRL - Ceiling mount, red.
   d. SCWL - Ceiling mount, white.
   e. SCRHL - Ceiling mount, red, high candela.
   f. SCWHL - Ceiling mount, white, high candela.
2. Contractor shall coordinate color with design team.
3. Mounted to comply with Americans with Disabilities Act.
4. Flush mounted unit shall have thermoplastic faceplate, trim shall have the word "FIRE".

J. Low Frequency Sounders:
1. Design based on Notifier HW-LF or equal.
2. Two wire, low frequency sounder for wall or ceiling installation.
3. Mount to comply with Americans with Disabilities Act (ADA).

2.04 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits: Building wire as specified by the manufacturer.

B. Initiating Device and Indicating Appliance Circuits: All fire alarm wiring shall be in metallic conduit or open raceway system concealed in finished areas as specified. Wiring shall be as specified by the manufacturer.

2.05 SPRINKLER FLOW AND TAMPER SWITCH

A. This contractor is responsible to wire all flow and tamper switches on all valves provided by the sprinkler contractor.

2.06 FIRE ALARM ANNUNCIATOR PANEL (FAAP)

A. Furnish and install where indicated on the drawings a remote annunciator panel. Panel shall provide alarm/trouble/reset capabilities to match main control panel information and features. Design based on Notifier #FDU-80

2.07 CELLULAR COMMUNICATOR

A. Fire alarm contractor shall coordinate with owner's preferred monitoring service Matt Davidson: email mdavidson@american-alarms.com or ph#515-266-9888 to provide code compliant cellular dialer.

B. Design based on Napco Starlink Max2.

C. Contractor shall confirm preferred Service with design team: AT&T or Verizon.

D. Provide other accessories as required for a functional, code-compliant system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install manual station with operating handle 48 inches on center above finished floor. Install audible and visual signal devices 90 inches above floor or six inches (6") below ceiling, whichever is lower in accordance with ADA Guidelines.

C. Automatic Detector Installation: Conform to NFPA 72.

D. Assist owner in providing cellular service to cellular dialer 4 weeks prior to substantial completion.

E. Provide and install monitor modules required to successfully monitor all planned Ansul, pre-action sprinkler and/or clean agent suppression systems.

F. This contractor shall be responsible for installing an indication system that meets or exceeds the required strobe intensity per NFPA 72.

G. This contractor shall be responsible for installing an indication system that results in a tone reaching 15 dB over ambient or louder. Horns shall not reach a volume that is greater than 105dB in any room.

H. Coordinate with design team to ensure signage is provided per code on door of room housing the Fire Alarm Control Panel.

I. This contractor is responsible to provide all necessary components and wiring for service to approved HVAC equipment 2000 cfm (and larger), approved kitchen hoods and approved fire suppression services. Coordinate exact requirements with HVAC, kitchen equipment, and fire suppression contractors.

J. This contractor is responsible to provide all necessary components and wiring for service to mute Sound Masking, Audio and Paging Systems:
   1. Connect Fire Alarm Control Unit (FACU) to the audio system utilizing a supervised line and addressable relays, per NFPA 72, to shut down and effectively mute all sound masking, audio and paging systems.
   2. The FACU and associated supervised lines to meet UL 2572 ensuring the shutdown mechanism is properly supervised and is reliable and will in no way damage the FACU or audio system.
   3. The FACU and associated relays must not introduce any noise into the sound masking, audio or paging system.
   4. Muting ambient sound during an emergency is necessary to meet ADA suggested guidelines and NFPA acoustic requirements.

3.02 ELECTRICAL REQUIREMENTS

A. All wiring shall be concealed within walls. No exposed raceways except areas with exposed structure. Coordinate conduit routing with the architect. Provide conduit for wiring located in non-accessible areas. In areas with accessible ceilings, use j-hooks as specified. Provide sleeves through walls and floors (3/4 inch minimum). Do not exceed a 40% pipe fill.

B. Minimum 3/4 inch conduit size.

C. Fire alarm cable installed in conduit shall not be shared by any other low voltage system cable.

D. All cable terminations shall be located within the device itself or in a junction box. Exposed splices are not acceptable.

E. Make conduit and wiring connections to door release devices, sprinkler flow switches, and sprinkler valve tamper switches. This contractor is responsible for all wiring and conduit to the sprinkler system post indicating valve, when this valve is provided. See drawings for location.

F. Provide and Install insulated bushing on end of raceways.

G. All fire alarm devices, junction and pull boxes shall be installed so they are easily accessible without removing light fixtures, equipment, conduits, junction boxes or other items.

H. Provide locking breaker on 120 VAC power source and label "Fire Alarm." Locking breaker shall be painted red. Any power source to FACP or devices shall be labeled with location of Power source for room number, panel and circuit number.

I. Fire alarm control and remote power panel's power shall be supplied by a surge protected dedicated circuit(s).

J. Auxiliary functions that are powered from a remote source must be monitored for power if they do not go to the operational mode for fire protection. (i.e. A power opener purge door that must open to purge air through building or a stairway air pressurization fan that must be monitored for power in case the breaker is shut off.)

3.03 FIELD QUALITY CONTROL

A. Test in accordance with NFPA 72.

B. Upon completion of the fire alarm system installation, the contractor shall provide a written statement advising the architect of completion and to be in compliance with fire and electrical codes, and in accordance with wiring diagrams, instructions and directions provided by the manufacturer.

C. Representative of the manufacturer shall certify the system complete and that the owner has received adequate instructions in system operation.

3.04 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. Include services of certified technician to supervise installation, adjustments, final connections and system testing.

3.05 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation and required responses to each.

3.06 CABLE

A. The fire alarm system manufacturer shall approve the low voltage cable and cable size. All low voltage electrical cable, which is installed as part of the new fire alarm system shall be plenum rated.

B. The cable that is installed without using raceway shall be neatly routed and supported every three feet (3'). All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceway. No cable shall be allowed to lie on the accessible ceiling tile.

3.07 CERTIFICATION

A. The fire alarm system shall be installed and operating within the manufacturers defined parameters and be certified by the manufacturer's representative's signature.

B. Certification shall be turned over to the owner prior to closing of this project.

END OF SECTION 28 31 00

SECTION 31 10 00 - SITE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing existing vegetation.
   2. Clearing and grubbing.
   3. Stripping and stockpiling topsoil.
   4. Removing above-grade and below-grade site improvements.
   5. Disconnecting, capping or sealing, removing site utilities or abandoning site utilities in place.

1.2 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

F. Demolish: Completely remove and legally dispose of off-site.

G. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

H. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.3 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 SUBMITTALS

A. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.5 QUALITY ASSURANCE

A. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where directed.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site preparation commences.

E. Do not commence site preparation operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near plant protection zones.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
   1. Flag each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.
   2. Owner will arrange to shut off indicated utilities when requested by Contractor.

B. Interrupting Existing Utilities: 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 Architect not less than two (2) days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 below exposed subgrade for existing plants occurring in areas outside of proposed building and paving areas.
   2. All stumps and roots occurring in areas of the proposed building and pavements are to be completely removed.
   3. Chip removed woody materials and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.4 VEGETATION STRIPPING, TOPSOIL STRIPPING & STOCKPILING

A. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. Six inches (6”) is considered the minimum stripping depth.
   1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

B. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Limit height to width ratio of topsoil stockpiles to prevent sloughing.
   2. Do not stockpile topsoil within tree protection zones.
   3. Dispose of excess topsoil as specified for waste material disposal.

3.5 SITE IMPROVEMENTS

A. Remove existing above-grade and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, dugouts, field lighting, fencing and others as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Rough grading.
   2. Fine grading.
   3. Preparing subgrades for slabs-on-grade, pavements, lawns and grasses and exterior plants.
   4. Excavating and backfilling for structures.
   5. Drainage course for slabs-on-grade.
   6. Subbase for concrete walks and pavements.
   7. Subsurface drainage backfill for trenches.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Drainage Course (Granular Fill): Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Excavation of Footings, Trenches, and Pits: Defined as Caterpiller Model No. 320CL or equivalent track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
   2. Bulk Excavation: Defined as Caterpillar Model No. 973C or equivalent track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, pavement, or topsoil materials.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Each type of plastic warning tape
   2. Aggregate
   3. Geotextile
   4. Controlled low-strength material, including design mixture

B. Samples: 12-by-12-inch samples of separation geotextile, and geogrid.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698, or ASTM D 4253 and D4254 where Standard Proctor Technique (ASTM D 698) does not result in a definable maximum dry density and optimum moisture content, for each borrow soil material proposed for fill and backfill.
   3. Field density test reports.
   4. Lab analysis of imported topsoil.

D. Construction Schedule and Sequencing
   1. Submit prior to commencing site operations
   2. Refer to Division 1 for information on critical schedule items

E. Erosion control measures
   1. Completed NPDES Permit
   2. Silt fence
   3. Seed mixtures

1.4 QUALITY ASSURANCE

A. Unless conflicting with this specification, perform work in accordance with Statewide Urban design and specifications (SUDAS), current edition.

B. Geotechnical Exploration
   1. A Geotechnical Exploration for the project was prepared by Allender Butzke Engineers, Inc.
   2. The Exploration is bound in this Project Manual.
   3. In the event there is a conflict between the recommendations of Allender Butzke Engineers and this Section of the Project Manual, the discrepancy must be reported and the discrepancy must be resolved before the specified work is undertaken.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver only materials that fully conform to these specifications, or for which submittals have been furnished to Owner and approved for use

B. Immediately remove cleared, grubbed, and excavated material in locations that will minimize environmental damage, protect adjacent areas from runoff, and not interfere with operations
   1. Control erosion around stockpiles

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify Owner not less than seven days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.
   3. Contact utility-locator service for area where Project is located before excavating.

B. Contract Limits:
   1. Contract limits are shown on the drawing.
   2. Contractor will maintain his construction operation within these limits.
   3. Disturbance or damage occurring outside these limits as a result of Contractor's operations will be repaired to original condition at no expense to the Owner.

C. If contaminated soils, historical artifacts, or other environmental or historic items are encountered, stop work and notify Owner immediately

D. Coordination
   1. Expose possible coordination conflicts in advance of construction, such as utility lines and drainage structures
   2. Verify elevations and locations of each utility and verify clearance for proposed construction
   3. Complete other elements of the Work which can affect line and grade in advance of other open cut construction unless noted on Drawings
   4. Coordinate abandonment of existing storm sewer or other drainage facilities with site work and grading to ensure positive drainage in all phases of the Work
   5. Notify Owner of conflicts discovered or changes needed to accommodate unknown or changed conditions

E. Coordinate the following activities with utility owners that have facilities in or near the work area
   1. Location of utility lines, mains, cables, and appurtenance shown on Drawings or from information furnished by utility companies and Owner
   2. Excavation and exposing of underground utilities in line of the Work
      a. Confirm location of underground utilities by excavating ahead of the Work
      b. Verify exact location of utilities by using hand excavation methods within 18 inches of marked utility lines as required by Iowa Code Chapter 480

F. Notify Owner and utility company immediately if utility line is damaged during construction and coordinate repair within 24 hours
   1. Contractor Responsibility For Utility Coordination and Damage
      a. Be solely responsible for all utility coordination and construction in area of existing utilities
         1) No claims for additional compensation allowed to Contractor for interference or delay caused by utility company
      b. Pay for damage to utilities or private or public property owners due to utility disruption

G. Preconstruction Meeting
   1. Attend Owner-facilitated preconstruction meeting

H. Sequencing
   1. Obtain necessary permits
   2. Remove items as shown on Drawings
   3. Install erosion control
   4. Construct underground utilities
   5. Construct Project in stages as shown on Drawings
   6. Adjust manholes and other fixtures to new grades

7. Backfill and finish grade earth surfaces as shown on Drawings

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Are defined as low plasticity cohesive soil with a liquid limit less than 45 and a plastic index of less than 23, further defined in the geotechnical report; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Are as defined in the geotechnical report.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Drainage Course (Granular Fill): Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel, meeting the requirements of IDOT Section 4131.

E. Topsoil: Defined as fertile, friable loam, capable of sustaining vigorous plant growth. Free from well drained site, free from flooding, not in frozen or muddy conditions. Free from subsoil, clay lumps, roots, grass, weeds, stones larger than ¾" in diameter and free from foreign matter. Acidity range (pH) of 5.5 to 7.5, containing minimum 4% and maximum percent organic matter.
   1. All stripped sod shall be removed from the site and shall not be used under fill or intermingled within the topsoil placement.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material per cubic yard as follows:
   1. Portland Cement: 50 lbs, ASTM C 150, Type I II or III.
   2. Fly Ash: 250 lbs, ASTM C 618, Class C or F.
   3. Fine Aggregate: 2910 lbs, ASTM C 33.
   4. Water: 60 gallons, ASTM C 94/C 94M.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, 12 inches below grade, continuously inscribed with a description of the utility.

B. Tracer Wire: No. 12 AWG solid copper wire, manufactured by Kris-Tech Cable, designed for burial applications. No splices are allowed in any tracer wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
      a. Remove rock to lines and grades indicated to permit installation of permanent construction.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Slope sides of excavations to comply with codes and ordinances having jurisdiction.
   3. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
   4. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 SUBGRADE INSPECTION

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below site areas to receive fill, the building slabs, and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Geotechnical Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect/Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect/Engineer.
1. Fill unauthorized excavations under other construction as directed by Architect, and per Section 3010 Iowa State Urban Standard Specifications for Public Improvements for pipe.

3.8 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.9 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill cohesive soil layer before compaction to a optimum moisture content range of -1 to +4 percent..
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent Std. Proc. for Cohesive Soil, 98% Std. Proc. for Cohesionless Soil, or 70% Relative Density.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent Std. Proc. for Cohesive Soil, 98% Std. Proc. for Cohesionless Soil, or 70% Relative Density
   3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent Std. proc.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.13 EMBANKMENTS

A. General: Prepare site, place, and compact excavated materials to required elevation and cross section.

B. Construction:
   1. Construct embankment in horizontal layers not more than 8” in loose thickness.
   2. Deposit each layer over full width of embankment as separate and distinct operation.
   3. After layer is deposited, smooth to uniform depth by means of suitable motor patrol or bulldozer.
   4. If soil is wet so that it will not sufficiently compact by one passing of roller per inch of loose thickness. Dry by discing.
   5. If soil is dry so that it will not satisfactorily compact by rolling, moisten material before compaction; manipulate material to secure proper distribution of moisture before compaction.
   6. Whenever operations are suspended during periods rain is likely to occur, smooth and compact surface to shed water readily.
   7. Compact according to the requirements of 3.14C.

3.14 TURF AREA CONSTRUCTION

A. Finish excavation and embankment work in compliance with contract document grade and cross section.

B. Grade and slope surfaces to drain.

C. Scarify construction traffic areas, material stockpile areas, construction trailer areas and other compacted soils to a depth of 12 inches prior to finish grading.

D. Smooth and finish grade to provide good seed bed

E. Prohibit construction traffic on finished turf areas

F. Monitor settlement until seed is established, adding material as needed and smoothing by hand methods where required to maintain required finish grade

3.15 PLANTING ZONE CONSTRUCTION

A. Finish excavation and embankment work in compliance with contract document grade and cross section

B. Leave designated planting zones 18 inches below finish grade and slope surfaces to drain
   1. Unless otherwise indicated on Drawings, planting zones extend out 15 feet from face of building
   2. Construct other planting zones where designated on Drawings

C. Scarify construction traffic areas, material stockpile areas, construction trailer areas and other compacted soils to a depth of 12 inches prior to finish grading

D. Shape to slope and cross section

E. Smooth and finish grade to provide a well drained and sloped planting zone suitable for planting

F. Prohibit construction traffic on finished planting zones

G. Monitor settlement for 1 month, adding material as needed and smoothing by hand methods where required to maintain required finish grade

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect or Geotechnical Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556 and ASTM D 2216 or ASTM D 2922 and ASTM D 3017 as applicable. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Additional testing may be required by Owner if noncompliance or change in conditions occurs.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.17 FIXTURE ADJUSTMENT

A. All manholes, catch basins, valve boxes, fire hydrants, etc., encountered within the areas to be paved or graded shall be adjusted to meet the finished surface of the proposed improvement.

B. The approximate locations of known manholes, catch basins, valve boxes, fire hydrants, etc are shown on the plans. Any damage resulting from the Contractor's operations shall be corrected at the Contractor's expense.

C. Set existing manholes to finished pavement grade or finished topsoil grade:
1. Remove existing manhole castings and pre-cast concrete cone section as required; add pre-cast concrete manhole sections and replace cone section.
2. Use adjusting rings to set casting at finished grade; twelve inches (12") maximum height; bed each ring with cold applied bituminous jointing material; Sewertite, Bigson-Homas, or equal.
3. With PCC pavement, pour manhole castings in slab; do not use box out without approval from Landscape Architect.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

D. Reconditioning Compacted Areas: Where completed subgrade or partial fill/backfill areas below pavements, buildings or site structures are disturbed by excessive drying, subsequent construction operations, erosion, or adverse wet weather, scarify surface, moisture condition to the specified moisture content range, re-shape, and compact to required density prior to further construction. Soils that have a moisture content in the upper 2" having less than 65% of optimum as determined by the Standard Proctor test shall be considered excessively dry.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Driveways.
   2. Parking lots.
   3. Curbs and gutters.
   4. Walkways.
   5. Warning Pavers.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with fly ash when permitted

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
   1. Aggregates. Delete paragraph and subparagraphs below if material test reports are not required.

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.
   5. Curing compounds.
   6. Applied finish materials.
   7. Bonding agent or epoxy adhesive.
   8. Joint fillers.

E. Jointing plan for parking lot and driveway paving. All driveway and parking jointing shall be constructed as per the Iowa Statewide Urban Design (SUDAS, most current edition) specifications and details.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with current additions of ACI 330R-08, "Guide for Design and Construction of Concrete Parking Lots," unless modified by requirements in the Contract Documents.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: MDO Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Furnish in the largest practicable sizes to minimize the number of joints and to conform to the submitted jointing plan.
   2. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets unfinished.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed billet steel bars, unfinished.

C. Plain Steel Wire: ASTM A 82, unfinished.

D. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs, unfinished.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type I, gray.
      a. Fly Ash: AASHTO M 295, Class C.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source for exposed concrete. Use crushed limestone aggregate for all exposed concrete and floor slabs. Gravel aggregate may be used for unexposed concrete.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Natural sand (resulting from disintegration of rock through erosional processes) consisting of clean, hard, durable, mineral aggregate particles free from injurious amount of silt, shale, coal, organic matter, or other objectionable material.

C. Limestone Coarse Aggregate: clean, hard, durable and uncoated with not more than the following limits of other material;
   1. Clay lumps, 0.5%

2. Coal and carbonaceous shale, 0.5%
3. Total of all shale, similar objectionable materials, and coal combined, 1.0%
4. Iron oxide, 0.5%
5. Organic materials, except coal, 0.1%
6. Unsound chert particles retained on 3/8 inch sieve, 2.0%
7. Chert particles which break into three or more pieces when subjected to Iowa DOT freezing and thawing test shall be considered unsound.
8. Chert in limestone aggregate is defined as unsound when any of the fractions on the crushed chert do not meet Iowa DOT soundness requirements.

D. Water: ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: AASHTO M 194, Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 1 percent water-soluble chloride ions by mass of cementitious material.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
7. Calcium chloride not permitted.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, burlap cloth made from jute or kenaf that has not been in contact wit wool, sugar, molasses, or other substance that might have an objectionable effect on fresh concrete, weighing approximately 10 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.5 RELATED MATERIALS

A. Isolation-Joint-Filler Strips: Asphalt treated fiber board joint material with backer rod or closed cell polyethylene foam. Asphalt impregnated materials are not acceptable.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 PAVEMENT MARKINGS

A. Pavement Marking Paint shall conform to the Manual on Uniform Traffic Control Devises (Federal Administration, 2009 Edition, or most current edition).

1. Color: White for traffic markings and as required by Iowa State Building Code for handicap accessibility markings.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   3. Slump Limit: 3 inches plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 7.5 percent plus 1.5 percent or minus 1 percent for slip form place concrete, and 7 percent plus 1.5 percent or minus 1 percent for non slip form paving resulting in 6 percent for finished concrete after consolidation.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing and retarding admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 as follows:
   1. Fly Ash rate shall not exceed 20%. Not allowed between October 16 and March 15.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below parking lots and drives with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
   3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:
   1. Top of forms not more than 1/8” in 10’.
   2. Vertical face on longitudinal axis, not more than 1/4” in 10’.

C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. All driveway and parking jointing shall be constructed as per the Iowa Statewide Urban Design (SUDAS, most current edition) specifications and details. In case of conflicting requirements, the more stringent shall apply.

C. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
   1. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   2. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

D. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Extend joint fillers full width and depth of joint.
   2. Terminate joint filler not less than 1/2 inch or more than 3/4 inch below finished surface if joint sealant is indicated.
   3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of the concrete thickness, as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   2. Seal sawed joints in parking lots and drives. Do not seal sawed joints in walks and terraces.
   3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
   2. Place concrete in two operations; strike off initial pour for entire width of placement and to the

H. Screed pavement surfaces with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish for Parking and Drives: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish for Walks and Platforms: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
   3. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Apply uniformly in 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. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and field cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

B. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days,

concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

E. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is cracked, broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Isolation and contraction joints within concrete pavement.

1.2 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.4 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, pot life, curing time, and mixing instructions for multicomponent 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.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet or covered with frost.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and

application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
   1. Available Products:
      a. Sonneborn, Div. of ChemRex, Inc.; Sonolastic SL 1.

2.4 HOT-APPLIED JOINT SEALANTS

A. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
   1. Available Products:
      a. Koch Materials Company; Product No. 9005.
      b. Koch Materials Company; Product No. 9030.
      c. Meadows, W. R., Inc.; Sealtight Hi-Spec.

2.5 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of backer materials.
   2. Do not stretch, twist, puncture, or tear backer materials.
   3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Chain Link Fences: Steel.
   2. Gates: Swing and sliding.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, reinforcements, and attachments.
   3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Provide structural design with signature and seal by a qualified engineer for each gate post footing design.

D. Samples for Verification: For each type of chain-link fence and gate indicated.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCE FABRIC

A. Galvanized steel wire: Galvanized steel core wire, tensile strength 75,000 psi (517 Mpa) with 0.30 oz./ft2 (92 g/m2) zinc for 9 gage.

B. Size: Helically wound and woven with 2 inch (50 mm) diamond mesh.

C. Selvage shall be knuckled top and bottom.

2.2 STEEL FENCE FRAMING

A. Steel Pipe – Type I: ASTM F 1083, standard weight schedule 40; minimum yield strength of 25,000 psi (170 Mpa); sizes as indicated. Hot-dipped galvanized with minimum average 1.8 oz./ft2 (550 g/m2) of coated surface area.

2.3 ACCESSORIES:

A. Chain Link Fence Accessories: ASTM F 626. Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.

B. Post Caps: Formed steel, cast malleable iron, or aluminum allow; weather-tight closure, cap for tubular posts. Provide one cap for each post. Where top rail is used, provide tops to permit passage of top rail.

C. Top Rail and Brace Ends: Pressed steel per ASTM F 626, for connection of rails and braces to terminal posts.

D. Top Rail Sleeves: 7 inch (178 mm) sleeve allowing for expansion and contraction of top rail.

E. Wire Ties and Clips: PVC coated, 9 gage, galvanized steel wire for attachment of fabric to line posts. Double wrap PVC coated 13 gage for rails and braces. Hot ring ties of 12-1/2 gage for attachment of fabric to tension wire.

F. Brace and Tension (stretcher bar) Bands: Pressed steel. At square post, provide tension bar clips.

G. Tension (stretcher) Bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16 inch x 3/4 inch (4.76 mm x 19 mm) or equivalent fiber glass road. Provide tension (stretcher) bars where chain link fabric meets terminal posts.

H. Tension Wire: Thermally fused vinyl (Permafused) applied to 0.40 oz./ft2 (122 g/m2) zinc coated steel wire, 7 gage, 0.177 inch (4.5 mm) diameter core wire with tensile strength of 75,000 psi (517 Mpa).

2.4 FENCE SCHEDULE

A. Chain Link Fence: 8’ Fence
   1. End and corner posts: 4” OD.
   2. Line posts: 4” OD.
   3. Concrete footings: See Detail.
   4. Top rail: 1 5/8” OD.
   5. Bottom rail: 1 5/8” OD.

2.5 GATE SCHEDULE

A. Typical Gate Type:
   1. 2.0” OD standard weight pipe: 2.72 lbs. per foot.
   2. Fabricate using welded construction or heavy pressed steel or malleable corner fittings securely riveted.
   3. Galvanized by hot-dip process.
   4. Equipped with positive type latching device with means for padlocking.
   5. Equipped with catch and semi-automatic outer catches to secure gate in open position.
   6. Provide center stop device to secure gates in closed position.
   7. Gate height same as the fence height in which the gate is to be installed.
   8. Footing design per manufacturer based on site’s soil conditions. Refer to geotechnical report for soil conditions.
   9. Gates 20’ wide and larger shall have wheels.

B. Slide Gate:
   1. Product to be similar to Hoover Fence Co. Aluminum Slide Gate (no barb)
   2. 25’ Gate opening w/ counterbalance per manufacturer’s recommendations.
   3. 8’ height
   4. Truck assembly with sealed roller bearings

5. Uprights: per manufacturer's recommendations for 8' tall slide gate.
6. Diagonals: per manufacturer's recommendations for 8' tall slide gate.
7. Top track: per manufacturer's recommendations for 8' tall slide gate.
8. All material 6061-T6 Extruded
9. Provide access control to the slide gate. Refer to Electrical Drawings.
    a. Slide Gate Operator: Hoover Fence Co. SL Series SLC-1. Coordinate with Electrical drawings.
    b. Access Control Pedestal: Surface mount gooseneck.
    c. Card Reader: Coordinate with Electrical drawings to ensure compatibility with card access system.
    d. Wireless Transmitter: Compatible with gate operator. Quantity: Four (4). (AD1)

2.6 GATE POSTS

A. Double leaf gates:
    1. 4.0" OD Schedule 40 pipe.
    2. Galvanized by hot-dip process.

2.7 CONCRETE POST FOOTINGS

A. Minimum 3,000 psi compressive strength at 28 days.

B. Gravel aggregate

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
    1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
    2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
    1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
    2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
        a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 8 feet o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
   1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
   1. Top Tension Wire: Install tension wire through post cap loops.
   2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Bottom Rails: Install, spanning between posts.

I. Chain-Link Fabric: Apply fabric to framework as indicated. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
   1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 32 31 13

SECTION 32 92 19 – LAWN SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Seedbed preparation
   2. Fertilizing
   3. Seeding
   4. Herbicide application
   5. Mulching
   6. Slope protect
   7. Maintenance

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

C. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

D. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Seed tags showing producers or dealers Iowa or Nebraska Permit Number and date of testing. Test date shall be no more than 90 days previous to time of use.

C. Product Certificates: For fertilizers from manufacturer.

D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawn during a calendar year. Submit before expiration of required initial maintenance periods.

E. Delivery Ticket: At time of seeding contractor shall submit Delivery Ticket with:
   1. Lot Number.
   2. Quantity purchased.
   3. Seed tag Lot Number shall match the delivery ticket Lot Number.

1.4 QUALITY ASSURANCE

A. Prior to the order of materials, the Contractor shall submit the following:
   1. The Seed Mix Installer shall employ only qualified, experienced supervisors and technicians skilled in the installation of this system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Store all packaged seed off ground and protect from moisture and temperature extremes. If necessary to store seed prior to use on the project site, it shall be stored in a cool, dry location to protect seeds from deterioration.

1.6 PROJECT CONDITIONS

A. Plant during the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Seed Mix for turf areas:
      a. Fall Planting: August 15 through September 15, inclusive.

B. Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED MIX TYPE

A. Provide fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Turf Seed:
   1. Seed Mix “Ignition Sports Turf MVP 70/30 Mixture.” As provided by D&K Products, or approved equivalent prior to bidding. www.dkturf.com.
      a. Contact: Tim Van Loo; timv@dkturf.com

2.2 FERTILIZERS

A. Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1.
   2. Composition: 13:26:13
   3. To be installed the day of seeding by the Contractor, then installed again 3 weeks after the initial installation.

2.3 BONDED FIBER MATRIX MULCH

A. Bonded fiber matrix mulch with the following characteristics:
   1. Materials: Wood fiber, Polysaccharide crosslinked hydro-colloid polymer tackifier.
   2. pH Range: 4.8 plus or minus 2.
   3. Moisture Content: 12+-3% percent maximum.
   4. Wood Fiber Content: 90 percent maximum.

5. Polysaccharide Crosslinked Hydro-colloid Polymer Tackifier: 10+-1%
6. Organic Content: 99 percent, plus or minus 1.
7. Ash Content: 1 percent, plus or minus 1.
8. Water Holding Capacity: 1,350 percent minimum.
9. Fiber Mulch Slurry Viscosity: Minimum 2.85 cps (Test Method: Falling Ball Viscometer) Test condition 1500 lbs of fiber mulch per 3000 gallons of water, evaluated immediately after mixing.

2.4 HERBICIDE

A. Herbicide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted herbicides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
1. Tupersan, as manufactured by DuPont. Spring seeding only.

2.5 EROSION CONTROL BLANKETS

A. Refer to SWPPP.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 SEEDBED PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect grade stakes set by others until directed to remove them.
2. Repair any erosion.
3. Eradicate any weed growth.
4. Loosen seed bed by lightly tilling.
5. Lightly rake to insure smooth, uniform surface texture with no dirt clods or stone greater than 1” in diameter.

B. Seed Mix Preparation:
   1. Prior to See Mix installation, Installer shall schedule an on-site pre-installation meeting with the Owner's Representative and Landscape Architect. The finish grades shall be approved prior to seed installation.

C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 FERTILIZATION

A. Apply at one (1) pound of actual phosphoric acid (P2O) per thousand (1000) sq. ft.

B. Apply to surface of topsoil or sand cap immediately before seeding.

3.4 SEEDING

A. Seed Mix Installation:
   1. Drill seed with a drill type seeding machine, as approved by Landscape Architect.
   2. Seed shall be drilled to depths greater than 1/8", but no deeper than 1/4".
   3. Drill seed at a total rate of 375 lb/acre.
   4. Each application of seed shall overlap the previous application by one-half (1/2) the width of the application to insure double coverage of seeded areas.
   5. In addition to over lapping of each seed application, seed in an overlap application in one direction and then an overlapping application at right angle to the initial application direction.
      a. Do not use wet seed or seed that is moldy or otherwise damaged.
      b. Limit extent of seed to outside edge of planting saucer.
   6. Roll lightly, and water with fine spray.
   7. Apply bonded fiber matrix mulch as required in section 3.5.

3.5 BONDED FIBER MATRIX MULCH (BFM)

A. Apply bonded fiber matrix mulch (BFM) to all seeded areas, to all seeded areas less than 4:1 slope, after seeding has been completed.

B. Strictly comply with manufacturer's installation instructions and recommendations.
   1. Use approved hydro-spraying machines.
   2. Apply BFM from opposing directions to soil surface, reducing the "shadow effect" and provide soil surface coverage of a minimum of 99%.
   3. Install materials at the manufacturers recommended application rate:

C. Protect adjacent building walls and pavement surfaces from overspray and clean spills promptly.

3.6 EROSION CONTROL BLANKET INSTALLATION

A. Install erosion control blankets on all slopes 4:1 and greater, immediately after completing seeding.

B. Install erosion control blankets in accordance with Manufacturer's installation specification and details.

3.7 MAINTENANCE

A. Maintain and establish seeded turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll,

re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Seed Mix shall maintain a height no greater than 3” throughout the construction period until Substantial Completion.
2. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
3. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

B. Water is available from on-site fire hydrants and other sources. Contractor to water seeding by providing all equipment and labor. Payment for water by the Owner if metered by Owner, or by contractor submission of meter generated water bills.

3.8 FINAL INSPECTION AND ACCEPTANCE

A. Turf installations shall meet the following criteria for acceptance as determined by the Landscape Architect:

1. Guaranteed germination percentages have been achieved.
2. Grass plants have emerged.
3. Grass requirements on mowing (as noted above).
4. Scattered bare spots do not exceed one-half (1/2) square foot in area.
5. Scattered bare spots do not exceed one percent (1%) of the total lawn area.

B. Upon completion of the work and fulfillment of the requirements of this section, notify the Landscape Architect in writing a minimum of five (5) business days prior to the requested inspection date that the work is ready for final inspection.

C. Reseed and maintain all seed areas which do not meet the requirements of this Section at the time of final inspection.

D. Replacement work (reseeding, maintenance, etc,) shall be as specified in this Section for original seeding.

E. Replacement work shall be re-inspected before acceptance.

3.9 CLEANUP AND PROTECTION

A. At all times, keep premises on which work is being done, and adjoining premises within and without the Contract Limits, clean of rubbish caused by the work.

B. Upon completion of the work, clean up all debris caused by the work and leave area within the Contract Limits in a neat and clean condition.

END OF SECTION 32 92 19

SECTION 32 92 19.23 – NATIVE GRASS SEEDING

PART 1 - GENERAL

A. Section Includes:
   1. Native grass seeding.
   2. Bonded Fiber Matrix Mulch; refer to Specification 32 92 19 Lawn Seeding
   3. Seeding related materials

1.2 SUBMITTALS

A. Seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentages by weight, and percentages of purity, germination, and weed seed for each grass seed species.

B. Planting Schedule: Proposed seeding schedule, indicating dates for seeding work and compliance with specified planting season. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

C. Manufacturer's Product Certificates and Installation Specifications:
   1. Seed and Seed Mix
   2. Bonded fiber matrix mulch.
   3. Erosion Control Blankets

D. Material Test Reports: Where required for existing surface soils and imported topsoil.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of native grass and wildflower seeding. Submit before expiration of required initial maintenance periods.

1.3 QUALITY ASSURANCE

A. Engage a single firm specializing in seeding to perform seeding as specified.

B. Native Grass Seeding Contractor Qualifications: A native grass seeding contractor whose work has resulted in successful native grass seed establishment.
   1. Experience: Three years experience in native grass seeding in addition to requirements in Division 01 Section "Quality Requirements."
   2. Native Grass Seeding Contractor's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress

C. Source Quality Control: Ship seeding materials with certificates of inspection required by governing authorities. Comply with regulations applicable to seeding materials.
   1. Do not make substitutions. If specified material is not obtainable, submit proof of non-availability to Owner’s Representative, together with proposal for use of equivalent material.
   2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

D. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

E. Soil Analysis: For each un-amended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt,

and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect.
3. A minimum of three representative samples of the in-place topsoil shall be taken from varied locations.
4. Report suitability of tested soil for native grass & wildflower seed growth.
    a. Based on the test results, state recommendations for topsoil treatments and topsoil amendments to be incorporated.
    b. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil suitable for healthy, native grass & wildflower growth.
    c. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

F. Pre-installation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. If seed is mixed prior to delivery on the site, it shall be tagged showing a guaranteed statement of composition of mixture and percentage of purity and germination of each variety.

B. If seed is to be mixed at the site, it shall be delivered in original containers bearing producers certification of germination and purity.

C. Tags shall show producers or dealers Iowa Permit Number and date of testing; test date shall be no more than 90 days previous to time of use.

D. Handling of materials as recommended by manufacturer.

E. Store all packaged materials off ground and protect from moisture and rodents.

F. Storage of all materials in locations designated and approved by Owner’s Representative.

G. Bulk Materials:
1. Coordinate on-site storage of bulk materials with the Owner
2. Do not store bulk materials near existing buildings and utility facilities.
3. Do not store bulk material on turf areas or on plant beds.
4. Only where permitted by the Owner, bulk materials may be stored on walkways and parking area pavements.
5. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

1.5 PROJECT CONDITIONS

A. Native Grass Seeding Restrictions: Unless otherwise approved by the Owner, install native grass seed between April 15 and June 30 only. Coordinate native grass seeding with initial maintenance to provide required maintenance from date of initial native grass and wildflower seeding through completion of the work.

B. Coordination with Lawn Seeding: Coordinate native grass seeding operations to minimize disturbance to adjacent Bluegrass seeded areas.

C. Weather Limitations: Proceed with native grass seeding only when existing and forecasted weather conditions permit native grass seeding to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.6 SEQUENCING & SCHEDULING

A. Planting Time: Proceed with, and complete seeding as rapidly as portions of site become available, working within seasonal limitations for each kind of seed required.

B. Chronological procedure for seeding, unless specified otherwise, is:
1. Remove any existing vegetation
2. Disc the area to be seeded,
3. Prepare the seedbed,
4. Seed,
5. Mulch, and
6. Protect slopes where required.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance: Provide full maintenance by skilled employees of native grass seeding contractor.

B. Requirements: Maintain native grass seeding as required in Part 3.

C. Schedule: Begin maintenance immediately after native grass seeding and continue until all related, deficient work has been satisfactorily repaired and final acceptance has been issued by the Owner

PART 2 - PRODUCTS

2.1 NATIVE GRASS SEED

A. General: Each seed mix bag shall bear seed supplier’s certification.

B. Reference drawings and coordinate with the General Contractor for definition of site areas to receive seed mixes.

C. Seed shall be fresh, clean, dry new-crop seed provided in original sealed packages bearing the producer’s guaranteed analysis for purity, germination, hard seed, and weed seed content. Labels shall be in conformance with AMS Seed Act and State of Iowa Seed laws.

D. Seed mixtures shall be proportioned by weight in PLS (Pure Live Seed) of representative seed mix for all seed species.

E. All legumes shall be inoculated with rhizobium bacteria at the rate specified by the manufacturer.

F. Where applicable, scarify seed coats for all native species that will be spring seeded.

G. NATIVE SEED is as follows:
1. NATIVE SEED MIX:
   a. Detention Basin – Bioswale Seed Mix:
      1) “Detention Basin – Bioswale Seed Mix” as supplied by Prairie Nursery Inc., P.O. Box 306, Westfield, WI 53964.

2.2 EROSION CONTROL MATERIALS

A. Refer to SWPPP.

PART 3 - EXECUTION

3.1 TOPSOIL TESTING EVALUATION

A. Perform topsoil testing at least 14 days in advance of seeding.

B. Submit topsoil test results and review recommendations with the Architect at least 10 days in preparation for native grass & wildflower seeding.

3.2 SEED AREA EXAMINATION

A. Examine areas to be native grass seeded for compliance with requirements and other conditions affecting performance.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within the areas to be seeded.

C. If contamination by foreign or deleterious material or liquid is present in soil within a native grass & wildflower seeding area, remove the topsoil and contamination as directed by Architect and replace it with new topsoil.

D. Proceed with native grass seeding only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by turf grass seeding operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Remove all surface vegetation.

D. Prepare subgrade and provide topsoil placement as specified.

E. Lightly disk the area to be seeded to a depth of four inches (4”). Take precautions to avoid mixing subsoil with topsoil.

F. Proceed immediately following tilling with seedbed preparation, and seeding.

3.4 SEEDBED PREPARATION

A. Operate all equipment to minimize displacement of soil and disturbance of proposed grade cross section.

B. Remove all ruts and fill all gullies and washes to conform to the proposed grade cross section.

C. Using a Rotadairon, or similar equipment, till all seeding areas to be a depth of 4” to burry rocks.

D. Ridging, in excess of four inches (4”), that is due to operation of tillage equipment will be harrowed and smoothed prior to cultipacking.

E. Smooth finished grade before cultipacking.

F. Prior to permanent seeding, roll the seeding area with a cultipacker; make two passes with the cultipacker over the area to be seeded, one pass should be at right angles to the other.

G. Repair erosion or other damage that occurs during seedbed preparation.

H. Remove all debris including stones larger than one inch (1”), logs, stumps, cable and other debris that could interfere with the seeding operation.

3.5 NATIVE GRASS SEEDING

A. Sow specified seed with an approved type seeder which is capable of being calibrated to distribute seed into the soil at not less than specified rates of application spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

B. Rake or drag seed lightly into top 1/8 inch (3 mm) of topsoil and roll lightly to obtain maximum soil-seed contact.

C. Seed Application:
   1. Seed 1/2 total seed quantity in rows and seed remaining 1/2 seed quantity in rows at right angles to first application at the following rates:
   2. Seeding Rate: 40 lbs. per acre.

3.6 EROSION CONTROL PRODUCT INSTALLATION

A. Immediately following seeding, install RECPs on all slopes 4:1 and greater.

B. Install erosion control blankets in accordance with Manufacturer’s installation specification and details.

3.7 NATIVE GRASS SEEDING MAINTENANCE

A. Immediately upon completion of installation of all products described herein the Owner will be advised to review the installation for compliance with the installation requirements.

B. Until all related deficient work is repaired and the Owner has issued final acceptance, the Contractor is responsible for maintaining all native grass seeded areas.

C. Contractor's maintenance and repair work will include:
   1. Restoration/repair of deficient and disturbed native grass seeded areas
   2. Weeding:
      a. Remove large weeds with clippers and remove clippings and seed heads from site.
      b. Do not pull weeds.
   3. Mowing:
      a. If weeds reach a height of 12” during the maintenance period, mow the area to a minimum height of 8” using a flail type mower.
   4. Re-seeding
      a. Re-seed as needed to meet establishment requirements.

D. Restoration and repair of disturbed native grass seeded areas:
   1. Provide materials and installation the same as those used in the original installation.
   2. Fill in as necessary soil subsidence that may occur because of settling or other processes.
   3. Replace materials and native grass seed damaged or lost in areas of subsidence.
   4. Apply treatments as required to keep native grass seed and soil free of pests and pathogens or disease.

5. Provide materials and installation the same as those used in the original installation.

3.8 SATISFACTORY NATIVE GRASS SEEDING

A. All products are installed as specified and all deficient work has been satisfactorily repaired.

B. Green-up of SEED MIX.

C. The Owner has reviewed, approved and final accepted the installation.

3.9 CLEANUP AND PROTECTION

A. Promptly remove topsoil and debris created by native grass seeding work from all site areas.

B. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

C. Remove all non-biodegradable erosion control products after the native grass seed has been established and accepted by the Owner.

D. Erect and maintain temporary fencing or barricades and warning signs as required to protect native grass seeded areas from traffic until the installation has been final accepted by the Owner.

END OF SECTION 32 92 19.23

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Trees.

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.

C. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.

D. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.

E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.

F. Finish Grade: Elevation of finished surface of planting soil.

G. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

H. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.

I. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

J. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

K. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each of the following:
   1. Organic mulch.

C. Agronomic Soil Analysis Reports.

D. Plant and Product Certificates:
   1. Certificates of inspection as required by governmental authorities.
   2. Manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials.
   3. Label data substantiating that planting materials comply with specified requirements.

E. Planting Schedule: Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in the area of the site. Correlate with specified maintenance periods to provide maintenance from date of Substantial Completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
   1. Normal seasons for this work as follows:
      a. Deciduous Trees: April 1 to June 1 and August 15 to November 15.
      b. Evergreen Trees: April 1 to June 1 and August 15 to October 1.

F. Maintenance Instructions: Typewritten instructions recommending procedures to be established by the Owner for maintenance of landscape work during the warranty period. Submit prior to expiration of required Contractor maintenance period.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

C. Availability: The Contractor shall have investigated the sources of supply and satisfied himself that he can supply the listed plants in the size, variety, and quality listed and specified before submitting his bid. Failure to take this precaution will not relieve the Contractor from his responsibility for furnishing and installing all plant materials in strict accordance with the Contract Documents without additional cost to the Owner

D. Plants: Provide plants of quantity, size, genus, species, and variety shown and scheduled for landscape work and complying recommendations and requirements of the current edition of ANSI Z60.1. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects.

E. Plant Labels: Each separately containerized, or balled and burlapped, plant brought to the site shall be labeled with securely attached waterproof tag bearing legible designation of botanical and common name. Flats of same plants may have one label per flat.
   1. If formal arrangements or consecutive order of trees is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

F. Observation: Landscape Architect may observe plants either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains right to observe trees further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees immediately from Project site.
   1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Trees:
   1. Provide freshly dug trees.
   2. Do not prune trees before delivery except as approved by Landscape Architect.
   3. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage.
   4. Do not bend or bind-tie trees in such a manner as to destroy their natural shape.
   5. Provide protective covering of exterior plants during delivery. Do not drop balled and burlapped stock during delivery and handling.
   6. Handle by root ball.

C. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants in shade, protect from weather and mechanical damage, and keep roots moist.

D. Do not remove container-grown stock from containers before time of planting.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to warranty requirements.

C. Coordination with Lawns: Plant after finish grades are established and before planting lawns unless otherwise acceptable to Landscape Architect.
   1. When planting trees after lawns, protect lawn areas and promptly repair damage caused by planting operations.

D. Water: Water is available on-site, provided by the Owner, for use by the installer.

1.7 INITIAL INSPECTION AND ACCEPTANCE

A. Initial inspection of the planting to determine completion of contract work will be made by the Landscape Architect once all items of work as outlined in Part 3 - Execution have been completed.

B. Submit written notice requesting such inspection at least five (5) days prior to the anticipated date.

C. After inspection, the Contractor will be notified in writing by the Landscape Architect of initial acceptance of the work inspected, exclusive of the possible replacement of plants subject to guarantee, or if there are any deficiencies of the requirement for completion of the work.

D. All plants shall be in a live and healthy condition at the time of initial acceptance.

E. Replacement of dead or rejected plants before initial acceptance shall not be considered a part of the warranty and replacement requirement of this section.

1.8 WARRANTY

A. Warranty all plants installed under this contract, other than annuals, for the duration of one (1) full year, but no less than one growing season after they are initially accepted as defined herein. A “growing season” shall be defined as, “the period which plant growth takes place. In temperate climates the growing season is limited by seasonal changes in temperature and is defined as the period between the last killing frost of spring and the first killing frost of autumn, at which time annual plants die and biennials and perennials cease active growth and become

dormant for the cold winter months." Plants shall be alive and in good, healthy and flourishing condition of growth at the end of the warranty period.

1. At the end of the warranty period, final inspection will be made by the Landscape Architect upon written notice requesting such inspection; submit notice to the Landscape Architect at least ten (10) days before the anticipated date of inspection.
2. Any plant required under this Contract that is dead or not in a vigorous, thriving condition, as determined by the Landscape Architect during the warranty period or at the time of final inspection, shall be removed from the site; these and any missing plants, due to the Landscape Contractor's negligence, shall be replaced as soon as conditions permit, but during the normal planting season.

B. Replace plants that are observed to be dead or in a badly impaired condition after initial acceptance at no cost to the Owner once during or at the end of the warranty period.

1. One replacement after initial acceptance shall constitute fulfillment of Contractor's warranty for the particular plant replaced.
2. All replacements shall be plants of the same kind and size as specified in the Plant Schedule. They shall be furnished and planted as specified herein.
3. Plants shall be replaced, staked, mulched, wrapped, fertilized, pruned, and restored to original condition at no cost to Owner.

C. Make all necessary repairs to grades, lawns, and paving required because of plant replacements. Such repairs shall be done at no extra cost to the Owner.

D. Plant replacement cost shall be borne by Contractor except for possible replacements resulting from removal, loss or damage due to occupancy of project in any part, vandalism, civil disobedience, or acts of neglect on the part of others, physical damage by animals, vehicles, fire, etc., or losses due to curtailment of water by local authority, or to "Acts of God". Floods, tornadoes, winds of hurricane force, and hail are not normal and the damage they do cannot be calculated in a bid.

PART 2 - PRODUCTS

2.1 TREE MATERIAL

A. General: Furnish nursery-grown trees complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Deciduous Trees: Provide trees of height and caliper schedule or shown and with branching configuration recommended by of current edition of "American Standard for Nursery Stock", for type and species required. Provide single stem trees except where special forms are shown or listed. Caliper of trees less than four inches (4") shall be taken six inches (6") above the ground. Trees four inches (4") and over shall be measured one foot (1'-0") above the ground level.

1. Provide balled and burlapped (B&B) deciduous trees. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Broken or loose balls will not be accepted.
2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations on current edition of "American Standard for Nursery Stock", for container stock.
3. Bare root trees are not acceptable.

C. Coniferous and Broadleaf Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicated minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad upright, and columnar. Provide normal quality evergreens with well-balanced form. Comply with requirements for other

size relationships to the primary dimension shown. Height and spread specified referred to main body of plant and not from tip to tip of branches or roots.

1. Provide balled and burlapped (B&B) evergreens. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant.
2. Bare root trees are not acceptable.

D. All plant materials shall be of the highest quality.

2.2 PLANTING SOIL

A. Soil excavated from planting pits that is similar in nature to topsoil.

1. Very poor soils of clay, gumbo, gravel, hardpan, and other soils injurious to plants shall not be used.
2. If quality of excavated soil is not adequate for planting, furnish planting soil consisting of partially decomposed vegetation. It shall be black, clean, low in content of mineral or woody material, mildly acidic, fertile, and friable.

2.3 SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

B. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

C. Limestone: Ground agriculture limestone; provided in original packaging, legibly labeled with fineness and liming ability shown.

2.4 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Ratio for Trees: 6:3:0.

2.5 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees consisting of one of the following:

1. Type: Shredded hardwood bark.

2.6 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Provide stakes similar or equal to steel farm fence posts. Steel fence posts shall be green vinyl coated or painted black with rust inhibiting primer. All stakes shall be the same.
2. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, No. 9 gage galvanized-steel wire, 2-strand, twisted.
3. Hose Chafing Guards: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.
4. Guy Cables: 5-strand, 3/16-inch diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
5. Anchors: Steel screw type anchors, 24 inches long, 3 inch plates.

6. Proprietary Staking –and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.
    a. Products: Subject to compliance with requirements, provide the following:
        1) Arborbrace, ArborBrace Tree Guying System

2.7 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before planting. Make minor adjustments as required.

D. Apply antidesiccant to trees using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
    1. If deciduous trees are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 EXCAVATION FOR TREES

A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.
    1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.

B. Subsoil removed from excavations may be used as backfill. See 2.4A, this section for acceptable subsoils.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees are encountered in excavations.

3.4 DRAINAGE TEST

A. Trees: Test a representative number of tree plant pits for drainage -- approximately 10%.

B. Fill each selected plant pit with water, observe and let stand for twenty-four (24) hours.

C. Notification: Report test results to the Architect before proceeding with planting.

3.5 TREE A PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

B. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.
   1. Remove burlap and wire baskets from tops of root balls and completely from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   2. Place backfill around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Fertilize trees after placing backfill, prior to final watering and before mulching. Apply fertilizer at the following rates:
   1. Large shade trees (4" caliper or larger): Two (2) pounds per inch of caliper.
   2. Small trees (less than 4" caliper): One (1) pound per inch of caliper.

D. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

E. Weed-Control Barrier: Install weed-control barrier over the mulched root ball according to manufacturer's written instructions. Completely cover the mulched, root ball area and securely pin the weed-barrier to the undisturbed soil surface adjacent to the excavated root ball area.

F. Retain first paragraph below if trunk-wrap tape is required. Revise to another form of tree protection if required.

G. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling.

3.6 MECHANIZED TREE SPADE PLANTING

A. Transplanted trees shall be moved with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

C. Cut exposed roots cleanly during transplanting operations.

D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.

E. Plant transplanted trees as shown on Drawings.

F. Where possible, orient the tree in the same direction as in its original location.

3.7 TREE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Remove and replace mis-formed stock resulting from the need for excessive pruning.

C. Prune, thin, and shape trees according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees.

3.8 PLANT MAINTENANCE

A. Tree Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees free of insects and disease. Restore or replace damaged tree wrappings.

B. Maintenance after Initial Acceptance of the plantings will be performed by the Owner.

3.9 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

3.10 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 32 93 00

SECTION 33 11 00 – WATER UTILITY DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. REFERENCED SPECIFICATIONS:
   1. DMWW (Des Moines Water Works):
      a. General Supplemental Specifications to the SUDAS (Iowa Statewide Urban Design Standards Specifications) Standard Specifications, Current Edition
      b. Water Service and Metering Specifications; amended January 30, 2017.
   2. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. Division 3 (Current Edition):
         1) Section 3010 – Trench Excavation and Backfill
      b. Division 5 (Current Edition):
         1) Section 5010 – Pipe and Fittings
         2) Section 5020 – Valves, Fire Hydrants and Appurtenances
         3) Section 5030 – Testing and Disinfection

1.2 SUMMARY

A. For construction of items covered by this section, utilize all provisions of the referenced specifications except:
   1. DMWW (Des Moines Water Works):
      a. General Supplemental Specifications to the SUDAS Standard Specifications:
         1) Division 1 provisions shall not apply.
         2) Division 7 provisions shall not apply.
         3) Division 9 provisions shall not apply.
   2. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. For all Sections:
         1) Part 1.08 Measurement and Payment: No measurement or unit prices will be utilized for this area of work.
   3. As explicitly noted or specified within the Contract Documents.

1.3 SUBMITTALS

A. Action Submittals:
   1. Gradation reports for bedding materials
   2. Shop drawings of casing spaces and proposed spacing for trenchless construction (if utilized).
   3. Product Data: For each type of pipe, fittings, valves, post indicator valves, fire hydrants, and appurtenances. Including:
      a. Manufacturer's certification that materials provided are in compliance with applicable requirements of the refenced standards of this specification.
      b. Dimensional drawings, fabrication details, functional description, catalog data, and manufacturer's data.
      c. Material test reports.
   4. Product information sheet for joint restraint system to be used.
   5. As required by SUDAS or DMWW

B. Informational Submittals:
   1. Results of required testing.
   2. Dewatering plan (if required).
   3. Proposed installation methods and equipment for trenchless construction (if utilized).

END OF SECTION 33 11 00

SECTION 33 31 00 – SANITARY SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. REFERENCED SPECIFICATIONS:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. Division 3:
         1) Section 3010 – Trench Excavation and Backfill
            a) Current Edition
      b. Division 4:
         1) Section 4010 – Sanitary Sewers
            a) Current Edition
         2) Section 4060 – Cleaning, Inspection and Testing of Sewers
            a) Current Edition
      c. Division 6:
         1) Section 6010 – Structures for Sanitary and Storm Sewers
            a) Current Edition
         2) Section 6030 – Cleaning, Inspection and Testing of Structures
            a) Current Edition
         3)

1.2 SUMMARY

A. For construction of items covered by this section, utilize all provisions of the referenced specifications except:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. For all Sections:
         1) Part 1.08 Measurement and Payment: No measurement or unit prices will be utilized for this area of work.
   2. As explicitly noted or specified within the Contract Documents.

1.3 SUBMITTALS

A. Action Submittals:
   1. Gradation reports for bedding materials
   2. Product Data: For each type of pipe, casing pipe, castings, sewer line connection gaskets, and appurtenances. Including:
      a. Manufacturer's certification that materials provided are in compliance with applicable requirements of the refenced standards of this specification.
      b. Dimensional drawings, fabrication details, functional description, catalog data, and manufacturer's data.
      c. Material test reports.
   3. Shop drawings of steel reinforcement, showing sizes, lengths, bends, and counts for sanitary sewer structures.
   4. Concrete mix design for sanitary sewer structures.
   5. Shop drawing schedule of all new manholes showing total depth, relative elevations of all connecting sanitary sewer lines, all drops, and orientation of connecting lines.

B. Informational Submittals:
   1. Results of required testing.
   2. Dewatering plan (if required).

END OF SECTION 33 10 00

SECTION 33 41 00 – STORM SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. REFERENCED SPECIFICATIONS:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. Division 3:
         1) Section 3010 – Trench Excavation and Backfill
            a) Current Edition
      b. Division 4:
         1) Section 4020 – Storm Sewers
            a) Current Edition
         2) Section 4060 – Cleaning, Inspection and Testing of Sewers
            a) Current Edition
      c. Division 6:
         1) Section 6010 – Structures for Sanitary and Storm Sewers
            a) Current Edition
         2) Section 6030 – Cleaning, Inspection and Testing of Structures
            a) Current Edition

1.2 SUMMARY

A. For construction of items covered by this section, utilize all provisions of the referenced specifications except:
   1. SUDAS (Iowa Statewide Urban Design Standards Specifications):
      a. For all Sections:
         1) Part 1.08 Measurement and Payment: No measurement or unit prices will be utilized for this area of work.
   2. As explicitly noted or specified within the Contract Documents.

1.3 SUBMITTALS

A. Action Submittals:
   1. Gradation reports for bedding materials
   2. Product Data: For each type of pipe, casing pipe, apron, castings, storm sewer line connection gaskets, and appurtenances. Including:
      a. Manufacturer's certification that materials provided are in compliance with applicable requirements of the refenced standards of this specification.
      b. Dimensional drawings, fabrication details, functional description, catalog data, and manufacturer's data.
      c. Material test reports.
   3. Shop drawings of steel reinforcement, showing sizes, lengths, bends, and counts for storm sewer structures.
   4. Concrete mix design for storm sewer structures and apron foundations.
   5. Shop drawing schedule of all new manholes and/or intakes showing total depth, relative elevations of all connecting storm sewer lines, all drops, and orientation of connecting lines.

B. Informational Submittals:
   1. Results of required testing.
   2. Dewatering plan (if required).

PART 2 - PRODUCTS

2.1 STRUCTURES

A. Aprons/ Flared End Sections to be RCP with no exceptions. Last pipe before apron may be RCP for connection to apron.

B. Outlet Control Structures to be modified SW-513 structures as per details.

C. Subdrain Outlet to have rodent guard.

2.2 PIPES

A. PVC or RCP pipe materials complying with SUDAS Section 4020 are considered an acceptable substitution for HDPE pipe materials.

B. HDPE pipes 12” in diameter and larger to be dual-wall.

END OF SECTION 33 41 00

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

JUNE 11, 2025 **PN 251201**

GEOTECHNICAL EXPLORATION

SE POLK TRANSPORTATION BUILDING AND IMPROVEMENTS
8445 NE UNIVERSITY AVENUE
PLEASANT HILL, IOWA

PERFORMED FOR

SE POLK COMMUNITY SCHOOL DISTRICT
8379 NE UNIVERSITY AVENUE
PLEASANT HILL, IOWA

3660 109TH STREET • URBANDALE, IOWA 50322 • PHONE 515-252-1885 • FAX 515-252-1888

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

June 11, 2025

SE Polk Community School District
8379 NE University Avenue
Pleasant Hill, Iowa
Attn: Mr. Kevin Baccam

RE: Geotechnical Exploration
SE Polk Transportation Building and Improvements
8445 NE University Avenue
Pleasant Hill, Iowa
PN 251201

Dear Mr. Baccam:

As authorized by you, Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience. We are also staffed and equipped to provide construction testing and inspection services on this project as well as environmental site assessments.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.

Abigail Ellerman, E.I.
Staff Engineer

Stacy G. Brocka, P.E.
Principal Engineer

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

6/11/2025

Stacy G. Brocka, P.E. License Number 14203 Date
My license renewal date is December 31, 2025.
Pages covered by this seal: All Pages.

Email Above
Email – RDG Planning and Design; Attn: Mr. Jason Blome, PLA, ASLA, LEED AP

GEOTECHNICAL EXPLORATION

SE POLK TRANSPORTATION BUILDING AND IMPROVEMENTS
8445 NE UNIVERSITY AVENUE
PLEASANT HILL, IOWA

PN 251201

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GEOTECHNICAL EXPLORATION

SE POLK TRANSPORTATION BUILDING AND IMPROVEMENTS
8445 NE UNIVERSITY AVENUE
PLEASANT HILL, IOWA

PN 251201

June 11, 2025

PROJECT INFORMATION

South East Polk Community School District, with design assistance from RDG Planning and Design (RDG), is planning improvements to their existing transportation facility located at 8445 NE University Avenue in Pleasant Hill, Iowa. Improvements include the addition of a new office suite building to their existing operations building and a new transportation building to the east side of the campus. Two detention basins will be constructed as well. Structural loads were not provided at the time of this report; however, we assume the proposed buildings will generate light to moderate structural loads, i.e., wall loads of less than 4 kips per lineal foot and column loads of less than 75 kips.

Based on the preliminary grading plan provided by RDG, the site gently slopes from the west edge near elevation 920 feet down to the east edge near elevation 895 feet. With a proposed finish floor elevation (FFE) of 910.75 feet for the new transportation building, we anticipate cut depths on the order 6 feet or less and fill thicknesses on the order of 10 feet or less will be required to achieve desired final grades.

FIELD EXPLORATION

Ten soil borings were conducted at this site to depths between 10 and 20 feet below existing grades on May 12, 2025. Approximate locations of the borings are shown on the enclosed Site Plan. Boring locations and ground surface elevations were determined by ABE using GPS survey equipment. The boring surface elevations, indicated on the enclosed Boring Logs, were Iowa Real-Time Network (RTN) derived. Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix.

SUBSURFACE CONDITIONS

Site Geology

This project site is located within a geomorphic region known as the "Southern Iowa Drift Plain". Soil stratigraphy generally consists of loess underlain by Pre-Illinoian glacial till. The loess is an eolian "wind-blown" deposit derived from flood plain sediments associated with major glacial meltwater streams and tends to have relatively uniform silt and clay particle sizes. Loess soils near the surface, termed B-horizon loess, have weathered over time and tend to have a higher clay content than the deeper unweathered loess. Similarly, the upper weathered portion of the Pre-Illinoian glacial till, referred to as paleosol, represents the former near surface soil before loess deposition and is typically a high clay content soil. The less weathered portions of the deeper Pre-Illinoian glacial till consist of a more homogeneous mixture of sand, silt and clay.

Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profiles of Borings (Plates A-1 to A-3) presented in the Appendix depicts the relative deposit elevations in the borings. Unless otherwise indicated, the depths of soil stratum and groundwater levels are referenced from below the top of existing ground at the individual boring locations at the time of drilling.

Brown lean clay (CL) and dark brown lean to fat clay (CL-CH) topsoil was encountered at ground surface in Boring Nos. 1, 2, 4, 5, 6, 8, and 10. The moist topsoil extended to a depth of 1 foot.

Boring No. 9 was conducted through 7 inches of Portland Cement concrete (PCC) pavement and dark brown and brown sandy lean to fat clay (CL-CH) fill was encountered underlying the pavement. Dark brown and brown lean clay (CL) fill was encountered at ground surface in Boring No. 7. The moist fill extended to a depth of 1.5 feet in Boring Nos. 7 and 9.

Very dark brown fat clay (CH) local alluvium was encountered in Boring No. 7 underlying the fill. Boring No. 7 terminated in the moist and stiff to very stiff local alluvium near a depth of 10 feet.

Brown lean to fat clay (CL-CH) and fat clay (CH) B-horizon loess was encountered at ground surface in Boring No. 3 and underlying the topsoil or fill in Boring Nos. 4, 5, 6, 8, 9, and 10. The moist and medium stiff to stiff B-Horizon loess extended to depths of 1.5 to 6 feet.

Brown-gray lean clay (CL) loess underlaid the topsoil and/or B-horizon loess in Boring Nos. 1 through 6, 8, 9, and 10. The moist to very moist and medium stiff loess in Boring Nos. 1, 2, 3, 4, 5, and 8 extended to depths between 3.5 and 11 feet. Boring Nos. 6, 9, and 10 terminated in the lean clay (CL) loess near depths of 10 and 15 feet.

Brown-gray and gray fat clay (CH) paleosol was encountered in Boring Nos. 1 through 5 and 8. These borings terminated in the moist and stiff to very stiff paleosol near depths of 10 to 20 feet.

Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our groundwater level observations are noted on the Boring Logs enclosed in the Appendix.

During drilling operations, moisture seepage was noted near depths of 6 to 11 feet below existing grades in Boring Nos. 3, 4, and 8. Groundwater accumulation was observed between depths of 4 to 13 feet below existing grades in Boring Nos. 3, 4, 8, and 10 at the completion of drilling operations while no groundwater accumulation was observed in the remaining borings. It should be recognized that these short-term groundwater levels are not necessarily a true indication of the groundwater table. Long-term observations would be necessary to accurately define the groundwater variations at this site.

In this area, it is common to encounter a perched groundwater table within the loess present above the denser less permeable paleosol. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

ANALYSES AND RECOMMENDATIONS

Existing Fill

Existing fill soils were encountered at the ground surface in Boring No. 7 and underlying the PCC pavement in Boring No. 9. Boring information indicates that the fill sections extended to a depth of 1.5 feet. Deeper fill sections could be present in other unexplored areas. The majority of fill soils encountered in the borings appear to be of suitable soil type for general fill applications. However, other undocumented fill exhibiting less desirable support characteristics could be present in other unexplored areas. Without documented background of the fill placement, there would be risk associated with constructing settlement sensitive structures on existing fill. By

constructing footings and floor slabs to bear in existing fill to avoid the costs of soil remediation, the owner would be accepting the risk of unpredictable settlement and possible future repair costs associated with constructing over unmitigated unsuitable fill.

The most reliable approach for supporting settlement sensitive structures would be to completely over-excavate or rework the existing fill soils and recompact suitable portions of the existing fill as engineered fill. The over-excavation and compacted backfill procedure should extend laterally 9 inches in all directions for each foot of over-excavation depth, or approximately 5 feet beyond the edge of the building. A coarse granular working mat may be required to facilitate backfilling operations if very moist soil conditions are encountered at the bottom of the over-excavation.

The owner may wish, for economic reasons, to assume the risk of settlement and cracking by constructing pavements over the existing fill soils since pavements are more easily repaired than settled buildings or floor slabs. We recommend that extensive geotechnical probing, testing, and observations be conducted by an ABE geotechnical representative during pavement subgrade preparation to further explore and evaluate the suitability of the existing fill soils. If unsuitable fill soils and/or rubble materials are encountered during this process, we recommend that an over-excavation and compacted backfill procedure be implemented. It should be recognized that the test probing during construction is intended to reduce the frequency of inadvertently constructing over deficient soils, but because of the methods and practical extent (3 feet deep) of hand probing, not all deficient zones may be detected and corrected.

Expansive Soil

The lean to fat clay (CL-CH) and fat clay (CH) B-horizon loess and local alluvium soils encountered in the upper portions of the test borings are moderately plastic (Liquid Limits of 45 to 55 and Plasticity Indices of 30 to 35) and are considered moderately expansive. These soils are subject to moderate volumetric change with changes in soil moisture content which can cause movement and distress to lightly loaded footings, floor slabs, and pavements. The most severe problems occur where higher clay content soils are in a natural state of low moisture or are highly compacted at moisture contents near or below optimum moisture content on a relatively incompressible base. Subsequent moisture content increases below the floor slab or pavement after construction then cause the moderately expansive soils to swell appreciably. If the moisture content does not fluctuate much, then the soil swelling and heave will be minor.

Based on a finished floor elevation of 910.75 feet, portions of the floor slab will bear in or directly above the moderately expansive soils. Therefore, to reduce the potential for future floor slab movement due to moderately expansive soils, we recommend floor slabs bear on a minimum

of 2 feet of low plasticity buffer materials. This recommendation will require undercutting and replacing existing moderately plastic soils with low plasticity buffer materials where the moderately expansive soils are present within 2 feet of the bottom of the floor slab. The low plasticity buffer materials may consist of one or more of the following:

1. Naturally occurring low plasticity cohesive soils with Liquid Limits (LL) of 45 or less and Plasticity Indexes (PI) of 23 or less. Portions of the deeper on-site lean clay (CL) loess soils (as appropriate) should satisfy this criteria.

2. Granular or cohesionless materials including crushed limestone or recycled concrete aggregate. The granular subbase under floor slabs is considered part of the low plasticity buffer zone.

3. The expansive soils can be chemically stabilized and function as a low plasticity buffer material. Our experience indicates that a treatment rate of about 6 percent dolomitic quicklime or 4 to 6 percent Portland cement by the soil's maximum dry density as determined by Standard Proctor (ASTM D698) is required to adequately stabilize the expansive soils. We recommend that a rotary pulvamixer be used to properly pulverize and thoroughly incorporate the chemical into the soil, as well as moisture condition the mixture for compaction.

The deeper fat clay (CH) paleosol soil is considered to be highly expansive. Based on boring information and our understanding of grading concepts for the site, the highly plastic paleosol soils (CH) are expected to be 3 feet or more below the bottom of slab-on-grade floors and foundations. Our experience indicates that floor slabs and foundations bearing 3 feet or more above the fat clay (CH) paleosol soils generally are not adversely impacted by these expansive soils.

Some of the foundations will likely bear in or just above the moderately expansive soils. Therefore, foundations bearing in these moderately expansive soils should have a sustained bearing pressure in excess of 600 pounds per square foot to resist the potential swelling pressures associated with these soils. In addition to the structure gravity dead load, the sustained bearing pressure also includes the weight of the concrete foundation and soil backfill on top of the spread footing projections. If the above sustained bearing pressure is not achieved, then the expansive soils beneath the foundations should be over-excavated a minimum of 2 feet and be replaced with suitable low plasticity buffer materials.

While over-excavation and replacement, chemical stabilization or providing the recommended low plasticity buffer zone generally reduces future floor slab movements to

acceptable levels, these methods do not necessarily eliminate all movements. For this reason, it is advisable to design the slab-on-grade floors slabs to "float" free of edge-restraint at walls and columns, and to provide vertical space for movement of any non-load bearing walls setting on the slabs.

Typical pavement movements due to moderately expansive soils (CL-CH, CH) are similar to movements that pavements commonly experience from frost heave. Considering that proposed pavements will be subject to frost heave movements, the risk of movement due to moderately expansive soils may be acceptable to the owner. It appears that the existing pavements are likely bearing on these expansive soils. Therefore, the current performance of the existing pavement should be considered when determining the potential risk of constructing directly on these soils.

If the owner chooses to accept the risk of possible future movements, we recommend pavements be supported on 1 foot or more of prepared compacted subgrade further discussed in the *Pavement Subgrade Preparation* section of this report. Subgrade condition and moisture content should be maintained until the slabs or pavements are placed. If the soil is allowed to dry prior to slab or pavement placement, the risk of future slab movement would then increase. If the owner prefers to take a more proactive approach to reduce pavement movement due to expansive soils, pavements could bear on 1 foot or more of low plasticity cohesive (Liquid Limit of 45 or less and Plasticity Index of 23 or less), chemically stabilized on-site plastic soils, or cohesionless soils, such as drained crushed rock similar to Iowa DOT 4123 Modified Subbase.

Contractors should be cognizant of the expansive nature of higher plasticity soils (CH) which are prevalent across the site and will likely be encountered during excavation for footings and utilities. Higher plasticity soils (CH) should be stockpiled separately from lower plasticity (CL) soils and should not be utilized as structural fill within 2 feet of the bottom of slab-on-grade floors.

Newly planted vegetation (trees and shrubs) or the existing vegetation close to the building may remove moisture from the nearby soils. Foundations and floor slabs can potentially settle due to shrinkage of soils beneath the footings and floor slabs as the soils dry, especially during drought periods when mature trees withdraw for moisture from nearby soils. As a general guideline, trees and shrubs should be kept a minimum horizontal distance away from the building equal to the ultimate height of the vegetation. Likewise, irrigation next to the building should be limited since it can contribute to soil swelling.

Site Grading

We recommend that low plasticity cohesive (Liquid Limit of 45 or less and Plasticity Index of 23 or less) or cohesionless soils, free of rubble and organics, be used as compacted fill. Inorganic existing soil such as the lean clay (CL) loess would be suitable soil types for general fill applications. As discussed in the *Expansive Soil* section of this report, the on-site lean to fat clay (CL-CH) and fat clay (CH) B-Horizon loess and local alluvium are moderately to highly expansive and should not be used as fill within 2 feet of movement sensitive structures but could be utilized as fill in deeper fill sections.

The following Table A lists recommended minimum compaction requirements for cohesive and cohesionless fill materials in specific applications. For cohesive soils, moisture contents within a range of -1 to +4 percent of the material's optimum moisture content are necessary to achieve the desired fill qualities. Soil compacted closer to its optimum moisture content will exhibit greater stability under repeated construction traffic.

TABLE A
RECOMMENDED DEGREE OF COMPACTION GUIDELINES

Construction Application	Standard Proctor (ASTM D698) Cohesive Soil	Standard Proctor (ASTM D698) Cohesionless Soil	*Relative Density (D4253 & D4254) Cohesionless Soil
Class 1	95%	98%	70%
Class 2	90%	93%	45%
Class 3	85%	88%	20%

Class 1 - Subgrade for building foundations, slabs-on-grade, pavements and other critical backfill areas.
Class 2 - Backfill adjacent to structures not supporting other structures - Minor subsidence possible.
Class 3 - Backfill in non-critical areas - Moderate subsidence possible.

*Use Relative Density technique (ASTM D4253 & D4254) where Standard Proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.

The on-site soils can be excavated utilizing conventional excavation equipment. Granular soils can generally be suitably compacted with vibratory compaction equipment whereas cohesive soils are more suitable for compaction with sheepsfoot or pneumatic type compactors. Care should be exercised in properly backfilling and compacting all trenches, especially utility trenches under

or adjacent to the pavement. Loosely compacted or sand backfilled trenches can collect surface water and inadvertently direct it to the pavement subgrade and cause softening of the soil as well as increasing frost heave potential.

At the time of this geotechnical exploration, moisture contents of the local alluvium and loess deposits were generally near to well above the recommended moisture content range for compaction. Depending upon precipitation levels prior to and during construction, adjustment of soil moisture content may be required in order to lower or raise the moisture to within the recommended moisture content range. Controlled wetting and discing may be necessary to raise soil moisture content of dry soils. Discing and aeration is generally the most economical method to lower soil moisture content, if climatic conditions allow. Chemical modification (drying) of very moist soils with Class C fly ash, Portland cement, or quicklime can be accomplished if construction scheduling does not permit field drying. Common chemical modification methods may not be reactive when temperatures are near or below 40° Fahrenheit if grading or fill placement at the site will be conducted during colder weather.

Deep Fill

Based on the preliminary grading plan, we anticipate up to 9 feet of new fill will be required to achieve desired final grades. The natural local alluvium and loess encountered in the upper portions of the borings will consolidate under the weight of new fill, causing general area settlement, especially in areas where more than 5 feet of new fill will be placed. Building foundations, floor slabs and other sensitive elements constructed before settlement (imposed by weight of new fill) is nearly complete will be subject to movement as consolidation continues in the underlying natural soils.

Based on boring information, we estimate total settlements on the order of 1 to 2 inches may be possible is areas more than 5 feet of fill will be placed. In areas with less than 5 feet of new fill, we estimate total settlements due to the weight of the new fill will be less than 1 inch. This settlement would be in addition to settlement caused by structural loads. The actual magnitude of settlements will depend upon the thicknesses of new fill placed and variable characteristics of the underlying compressible natural soils.

Typically, 50 percent or more of the total settlement occurs during fill placement and shortly after fill placement. One common option to address the remaining settlement includes a consolidation waiting period/delay after fill placement before constructing settlement sensitive footings, floor slabs, and pavements. We recommend a consolidation waiting period on the order of 3 to 4 weeks, where new fill thicknesses more than 5 feet deep will be placed. Construction can

be ongoing in the other remaining areas where grades have been cut or less than 5 feet of fill has been placed.

If the construction schedule is critical, settlements could be monitored with multiple settlement plates and/or monuments installed in the deeper fill areas to determine more accurately when settlement is essentially complete and construction can proceed.

Excavation Stability and Dewatering

Boring information indicates excavations at the site for foundations and utilities will encounter predominately cohesive soils with no wet sand seams or layers. It is expected that the water seepage can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand may tend to cave rapidly, especially if water is flowing through the sand. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

Foundation Design

In our opinion, newly placed engineered compacted fill and suitable natural soils can provide adequate support for the proposed structure. We recommend that continuous and isolated spread foundations bearing on suitable soils be proportioned for a maximum net allowable soil bearing pressure of 1,500 pounds per square foot. We estimate long-term total settlement due to the assumed structural loads will be less than 1 inch and differential settlement may be on the order of ½ of the total settlement when foundations bear on newly placed engineered compacted fill and suitable natural soils. Structural and architectural connections should be designed to accommodate the differential settlement that may occur between the existing building and the new addition. Excavations extending into the very moist loess will be easily disturbed by construction traffic and

may require a working mat consisting of clean coarse crushed rock at the bottom of footing excavations to reduce disturbance and facilitate foundation construction.

Continuous foundations should be adequately reinforced to limit deflections caused by non-uniform soil support characteristics. All exterior foundations and foundations in unheated areas should be placed a minimum of 3.5 feet below final grade to provide protection against frost penetration and reduce movements associated with changes in soil moisture content. Footing excavations should be kept free of water accumulation to prevent softening of subgrade soils. Foundation excavations should be conducted in a manner that avoids disturbance of soils below the existing foundations.

Observations and test probing of the foundation subgrade soils should be conducted by an ABE geotechnical engineer to determine that the soils are compatible with the design criteria. If zones of soft or otherwise unsuitable soils are encountered at foundation level, we recommend that footings be extended to bear on firmer soils or an over-excavation and compacted backfill procedure be implemented. Over-excavations should extend 9 inches laterally in each direction beyond the foundation edges for each foot of over-excavation depth.

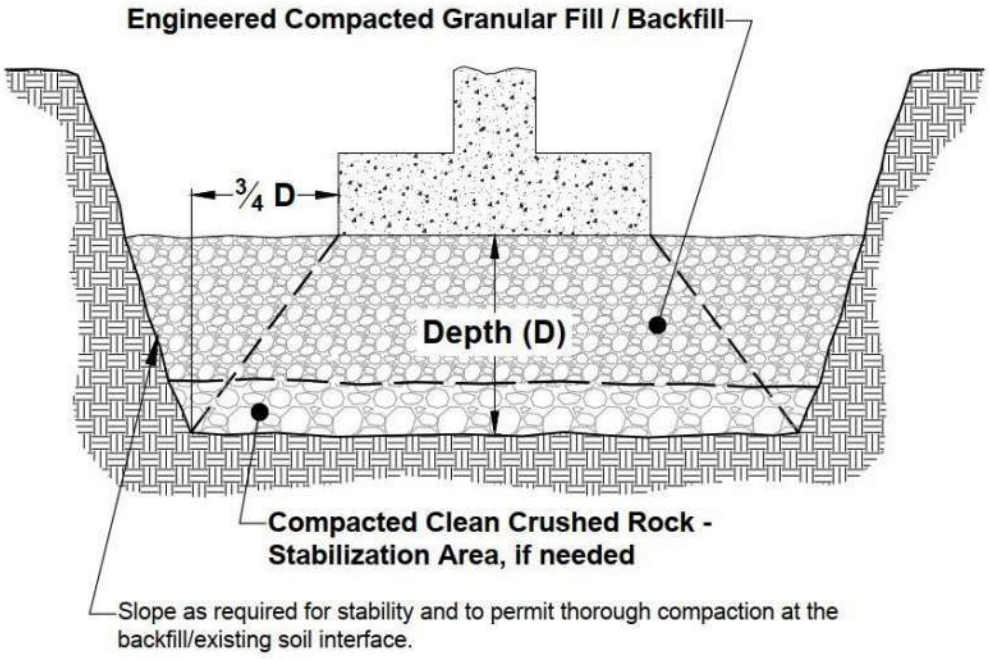


Figure No. 1 – Typical Footing Over-Excavation

Floor Slab Support

As discussed in the *Expansive Soil* section, we recommend the proposed building be supported on 2 feet or more of low plasticity compacted engineered fill. The floor slab can be designed for a modulus subgrade reaction value of 125 pounds per cubic inch when bearing on the recommended subgrade. Testing, observations, and probing should be conducted during construction to delineate zones of soft soils which may require repair prior to concrete placement.

Pavement Subgrade Preparation

Uniform subgrade support is critical in pavement performance. As discussed in the *Existing Fill* and *Expansive Soil* sections of this report, there is risk of movement and cracking associated with constructing new pavements over the existing fill and moderately expansive natural soils encountered at this site. The risk of pavement movements may be acceptable to the owner for economic reasons, as pavements are more easily repaired than footings and floor slabs. In our experience, movements that pavements experience due to the on-site moderately expansive soils are similar to movements that pavements experience due to frost heave are similar that pavements. Considering that proposed pavements will be subject to frost heave movements, the risk of movement due to moderately expansive soils may be acceptable to the owner. Evaluation of the performance of the existing pavements bearing directly on the expansive soils should be considered when deciding to support the new pavements on these soils.

If the owner chooses to accept the risk of future pavement movements by constructing new pavements over existing fill and moderately expansive soils, we recommend proof-rolling and technical observations be conducted by an ABE geotechnical engineer during subgrade preparation. As a minimum, we recommend that the prepared subgrade depth be at least 1 foot deep after fine grading or trimming and extend 2 feet beyond the edge of the pavements. The recommended 1 foot of compacted subgrade may necessitate undercutting and reworking soils in cut areas. Subgrade preparation to 1-foot depths for some soil types may not be suitable under repeated heavy construction vehicle loads and may require stabilization to greater depths.

If the owner prefers to take a more proactive approach to reduce pavement movement due to moderately expansive soils, pavements could bear on 1 foot or more of low plasticity cohesive (Liquid Limit of 45 or less and Plasticity Index of 23 or less), chemically stabilized on-site plastic soils, or cohesionless soils, such as drained crushed rock similar to Iowa DOT 4123 Modified Subbase.

Subgrade preparation should be completed shortly before paving operations commence and is to be maintained in suitable condition until paved. Damages caused by construction traffic or deterioration due to adverse weather are to be repaired prior to paving.

Depending upon conditions encountered at the time of construction, it may be necessary to moisture condition existing soils to achieve the recommended moisture content range of -1 to +4 percent of optimum moisture content. Soils compacted closer to optimum moisture content will exhibit greater stability under construction traffic loading. Suitable cohesive soil compacted to a minimum of 95 percent of maximum dry density determined by ASTM D698 would provide a design support capability equivalent to a CBR value of 3 or a modulus of subgrade reaction value of 100 pounds per cubic inch. Subgrade compaction, moisture content and depth should be verified by an ABE representative.

Pavement Subsurface Drainage

Based on boring information and possible seasonal high groundwater levels at this site, we recommend subsurface pavement drainage be constructed below pavements and parking lots that are placed in areas with 2 feet or more of cut. Subsurface drainage is also recommended if a granular subbase is utilized beneath the pavement.

The permeable subbase, if utilized beneath the pavement, should be hydraulically connected to the free draining granular backfill (similar to Iowa DOT Specification 4131) in the subsurface drains. Subsurface drainage may be accomplished with the installation of drainlines similar to the Iowa DOT detail DR-303 or Iowa SUDAS Figure 4040.231. In parking areas, subdrains should be spaced approximately 50 to 75 feet center to center and may be constructed to daylight or be connected to gravity flow storm drains capable of handling the discharge. We are available to review the subdrain layout design, once the final grading plan becomes available, which can be modified at time of construction to accommodate site specific variations in the soil profile and if seepage zones become evident.

Pavement Thicknesses

Either rigid (Portland cement concrete, PCC) or flexible (hot mix asphalt, HMA) pavement types could be constructed on the prepared cohesive subgrade. The following Table B summarizes alternate pavement thicknesses for typical lightly-loaded, moderately-loaded and heavily-loaded paved areas. If a minimum 6-inch-thick crushed rock base (such as IDOT 4123 Modified Subbase) with drains is constructed on the compacted subgrade to support the pavement, the recommended thicknesses of PCC or HMA pavement may be reduced by ½ and 1 inch, respectively. However, we recommend the lightly-loaded 5-inch-thick PCC pavement section not be reduced. A more

specific pavement evaluation can be provided if traffic volume and loading information is available.

TABLE B
TYPICAL PAVEMENT THICKNESSES

Traffic Volume	Rigid: PCC [1]	Flexible: HMA [2]
Lightly-Loaded [3]	5" [4]	6"
Moderately-Loaded	6"	7"
Heavily-Loaded [5]	7"	8"

1) PCC - Flexural strength of 550 psi
2) Type A HMA - Structural coefficient of 0.44/inch
3) Automobile and 1 to 2 trucks average daily traffic
4) Thickness reduction due to crushed rock subbase does not apply
5) Entrances, delivery areas, dumpster areas or other areas of heavier truck traffic (25 trucks or less per day)

The above pavement thicknesses are considered to be typical and would require periodic maintenance. This maintenance would consist of sealing cracks/joints and replacement of isolated distressed areas. Thicker pavement sections would reduce maintenance and increase the pavement service life. Likewise, thinner sections would be expected to have a shorter service life that still may satisfy particular project needs but may require more maintenance. Other criteria which influence pavement service life include surface drainage, subsurface drainage, paving material quality, reinforcement, and joint design. Construction procedures involving placement, finishing, curing, jointing and weather protection can significantly impact pavement performance.

Frost Heave

Key elements contributing to frost heave including freezing temperatures, available water, and fine-grained frost susceptible soils are generally present at sites in Iowa. As a result, frost heave problems are generally common (and most noticeable) in pavements or sidewalks adjacent to non-frost susceptible elements such as manholes, light poles, and exterior doors or frost protected stoops. Frost heave can cause pavement cracks to develop parallel to and several feet from curbs. This generally occurs where cleared paved areas exposed to freezing temperatures heave more than adjoining paved areas insulated by piled snow. Areas cleared of snow not exposed to periodic sunshine during the winter, such as under canopies, on the north shaded side of buildings and other shaded areas may experience more frost heave than other sunshine exposed areas. Sometimes it is not readily apparent why frost heave problems occur at one location and not at another seemingly similar location.

While it is appropriate to implement measures to reduce frost heave such as insulation, replacing frost susceptible soils with less frost susceptible soils, void forms, sealing cracks/joints to reduce surface water infiltration, or drainage improvements (surface and subsurface), these measures may simply move the frost heave problem to a different location where preventative measures have not been implemented. Having a smooth transition between heaved and non-heaved areas is desirable, but may be difficult and/or costly to accomplish. We are available to consult with you to discuss options for your consideration to reduce frost heave potential on this project.

GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air on, below or adjacent to this site.

APPENDIX

BORING LOG DESCRIPTION/LEGEND

The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

Drilling Methods

CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
HA - Hand Auger: 4-inch or less diameter.

Sample Types

ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
BS - Bulk Sample: Disturbed.
CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

BORING LOG DESCRIPTION/LEGEND

DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name
GW	Well-Graded Gravel	SW	Well-Graded Sand	CL	Lean Clay	CH	Fat Clay
GP	Poorly-Graded Gravel	SP	Poorly-Graded Sand	ML	Silt	MH	Elastic Silt
GM	Silty Gravel	SM	Silty Sand	OL	Organic Clay Organic Silt	OH	Organic Clay Organic Silt
GC	Clayey Gravel	SC	Clayey Sand			PT	Peat

RELATIVE PROPORTIONS			GRAIN SIZE TERMINOLOGY	
Descriptive Term(s) (Of components also present in sample)	Sand and Gravel % of Dry Weight	Fines % of Dry Weight	Major Component of Sample	Size Range
Trace	<15	<5	Cobbles	12 in. to 3 in. (300mm to 75mm)
With	15-30	5-12	Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Modifier	>30	>12	Sand	#4 to #200 sieve (4.75mm to 0.074mm)
			Silt or Clay	Passing #200 sieve (.074 mm)

CONSISTENCY OF FINE-GRAINED SOILS			RELATIVE DENSITY OF COARSE-GRAINED SOILS	
Unconfined Compressive Strength, Qu, psf	Consistency	SPT, bpf	SPT, bpf	Relative Density
< 500	Very Soft	0-2	0-4	Very Loose
500-1,000	Soft	2-4	4-10	Loose
1,000-2,000	Medium Stiff	4-8	10-30	Medium Dense
2,000-4,000	Stiff	8-15	30-50	Dense
4,000-8,000	Very Stiff	15-30	50-80	Very Dense
8,000-16,000	Hard	30-100	80+	Extremely Dense
> 16,000	Very Hard	>100		

BORING LOG DESCRIPTION/LEGEND

ABBREVIATIONS

COMMONLY USED ABBREVIATIONS	
ft. or ' - feet	elev. - Elevation
in. or " - inches	% - Percent
psf - pounds per square foot	No. - Number
plf - pound per lineal foot	TB - Test Boring
pcf - pounds per cubic feet	N - blow count (SPT, bpf)
kip - 1000 pounds	USCS - Unified Soil Classification System
ksf - 1000 pounds per square foot	LL - Liquid Limit
klf - 1000 pounds per lineal foot	PL - Plastic Limit
tsf - tons per square foot	PI - Plasticity Index
bpf - blows per foot (SPT, N)	

BORING LOG NO. 1

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **909.3'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **20**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Brown lean clay, trace organics, moist		CL		1
								TOPSOIL				
908		1	SSA	5	17.9			Brown-gray lean clay, moist to very moist		CL		908.3
906												
	4	2	ST		25.7	93	2050	**LOESS**				
904												
		3	ST		25.4	94	1560					6.5
902								Brown-gray fat clay, trace sand, moist		CH		902.8
	8											
900		4	SSA	10	27.5			Gray after 9'				
898												
	12											
896								**PALEOSOL**				
		5	ST		17.9	109	5700					
894												
	16											
892												
890		6	SSA	15	15.8							20
	20							End of Boring				889.3
888												
886												
	24											
884												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 2

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **904.0'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **15**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
904	0							Dark brown lean clay, trace organics, moist **TOPSOIL**		CL		1
902		1	SSA	5	25.2			Brown-gray lean clay, moist to very moist **LOESS**		CL		903 3.5
900	4	2	SSA	7	25.0			Brown-gray fat clay, trace sand, moist		CH		900.5
898		3	ST		26.4	96	4320					
896	8	4	ST		24.9	99	4320	Gray after 9' **PALEOSOL**				
894												
892	12											
890		5	SSA	15	17.2							15
888	16							End of Boring				889
886												
884	20											
882												
880	24											
878												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 3

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **909.1'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **15**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
908	0							Brown lean to fat clay, moist Trace organics in upper 1 foot		CL-CH		1.5
		1	SSA	7	22.1			**B-HORIZON LOESS** Brown-gray lean clay, moist to very moist		CL		907.6
906												
904	4	2	SSA	6	25.7			**LOESS**				
902		3	ST		26.3	93	1290					
	8											
900		4	ST		26.9	95	1780	Moisture seepage near 8.5'				9
								Gray fat clay, trace sand, moist		CH		900.1
898												
	12							**PALEOSOL**				
896											▽	
		5	SSA	10	22.2							15
894								End of Boring				894.1
	16											
892												
890												
	20											
888												
886												
	24											
884												
882												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **13** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 4

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **912.4'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **20**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
912	0							Dark brown lean to fat clay, trace organics, damp to moist		CL-CH		1
		1	SSA	9	26.9			**TOPSOIL**				911.4
910								Brown-gray lean to fat clay, moist		CL-CH		
								B-HORIZON LOESS				3
	4	2	SSA	4	30.1			Brown-gray lean clay, moist to very moist		CL		909.4
908												
906		3	ST		27.9	91	710	**LOESS**				
	8											
904		4	ST		27.2	92	1970					
902								Moisture seepage near 11'			▽	11
								Brown-gray fat clay, trace sand, moist		CH		901.4
900	12											
		5	ST		27.2	94	1900	Gray after 13.5'				
898								**PALEOSOL**				
	16											
896												
894		6	SSA	17	18.6							20
	20							End of Boring				892.4
892												
890												
	24											
888												
886												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **11** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 5

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **908.3'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **15**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
908	0							Dark brown lean to fat clay, trace organics, moist		CL-CH		1
								TOPSOIL				907.3
906		1	SSA	10	25.9			Brown lean to fat clay, moist **B-HORIZON LOESS**		CL-CH		
												3.5
904	4	2	SSA	7	25.3			Brown lean clay, moist to very moist **LOESS**		CL		904.8
												6
902		3	SSA	13	23.9			Brown-gray fat clay, trace sand, moist		CH		902.3
900	8											
		4	ST		24.0	91	3350					
898								**PALESOL**				
896	12							Gray after 11'				
894		5	ST		20.4	102	4270					15
								End of Boring				893.3
892	16											
890												
888	20											
886												
884	24											
882												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 6

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **912.1'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **10**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
912	0							Brown lean to fat clay, trace organics, moist **TOPSOIL**		CL-CH		1
		1	SSA	11	21.9			Brown lean to fat clay, moist **B-HORIZON LOESS**		CL-CH		911.1 2.5
910								Brown-gray lean clay, moist to very moist		CL		909.6
908	4	2	SSA	6	26.8							
906		3	ST		26.9	93	800	**LOESS**				
904	8	4	ST		28.6	91	1020					
902								End of Boring				10 902.1
900	12											
898												
896	16											
894												
892	20											
890												
888	24											
886												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 7

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **909.4'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **10**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
908	0							Dark brown and brown lean clay, moist **FILL**		CL		1.5
		1	SSA	5	29.2			Very dark brown fat clay, moist		CH		907.9
906	4	2	SSA	9	26.6							
904								**LOCAL ALLUVIUM**				
		3	ST		23.1	100	4590					
902	8											
900		4	ST		24.6	96	5300					10
								End of Boring				899.4
898	12											
896												
894	16											
892												
890	20											
888												
886	24											
884												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 8

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **904.8'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **10**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
904	0							Dark brown lean to fat clay, trace organics, damp to moist		CL-CH		1
								TOPSOIL				903.8
902								Brown lean to fat clay, moist **B-HORIZON LOESS**		CL-CH		
	4	1	SSA	3	29.8						▽	4
900								Brown-gray lean clay, very moist **LOESS**		CL		900.8
								Moisture seepage near 6'				6.5
898								Brown-gray fat clay, trace sand, moist		CH		898.3
	8							**PALEOSOL**				
896		2	ST		28.0	93	5080					10
894								End of Boring				894.8
	12											
892												
890												
	16											
888												
886												
	20											
884												
882												
	24											
880												
878												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **4** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 9

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **921.9'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **15**

Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							**PCC (7"±)**				0.6
		1	SSA	10	21.9			Dark brown-brown sandy lean to fat clay, damp to moist		CL-CH		921.3
920								**FILL**				1.5 / 920.4
		2	ST		25.5	89	2300	Brown lean to fat clay, moist **B-HORIZON LOESS**		CL-CH		
918	4											5.5
		3	ST		25.1	88	1070	Brown-gray lean clay, moist to very moist		CL		916.4
916												
914	8	4	SSA	4	29.9							
912								**LOESS**				
910	12											
		5	ST		27.6	91	980	Gray after 13'				15
908								End of Boring				906.9
906	16											
904												
902	20											
900												
898	24											
896												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion _____ hrs. _____ days

Depth to water: **Dry** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 10

Project No.: 251201

Project: **SE Polk Transportation Building & Imps.**
8445 NE University Avenue
Pleasant Hill, Iowa

Client: **SE Polk Community School District**
8379 NE University Avenue
Pleasant Hill, Iowa 50327

Surface Elevation: **914.0'**
Datum: **Iowa RTN**

Date Drilled: **5/12/2025**
Drilling Depth, ft.: **15**

Drilling Method: **4" CFA**
Page: **1** of **1**

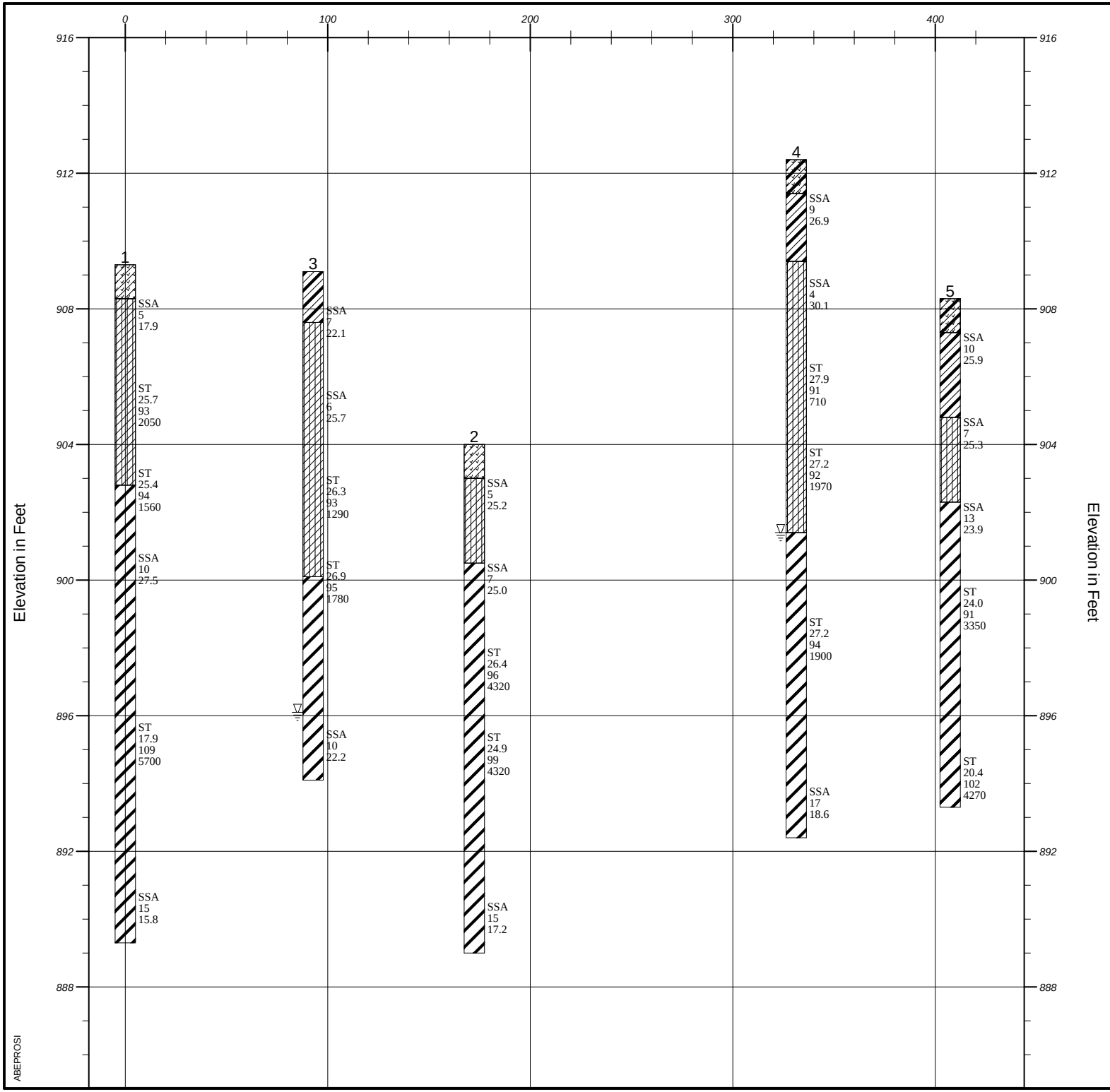
Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
914	0							Dark brown lean to fat clay, trace organics, moist		CL-CH		1
								TOPSOIL				913
912								Brown fat clay, moist Liquid Limit = 50, Plasticity Index = 31		CH		
								B-HORIZON LOESS				
910	4	1	SSA	4	29.8			Brown lean to fat clay, moist to very moist after 4' Liquid Limit = 45, Plasticity Index = 27		CL-CH		
908												6
								Brown-gray lean clay, very moist		CL		908
906	8											
		2	ST		25.7	95	710					
904								**LOESS**				
902	12										▽	
		3	ST		23.5	98	1380					15
900								End of Boring				899
898	16											
896												
894	20											
892												
890	24											
888												

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

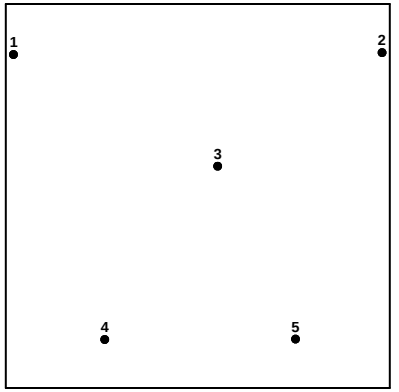
Water Level Observation
Time: at completion _____ hrs. _____ days
Depth to water: **13** ft. ▽ _____ ft. ▼ _____ ft. ▼

ALLENDER BUTZKE ENGINEERS, INC.
Geotechnical | Environmental | Construction Q.C.

PROFILE OF BORINGS



Plan View (NORTH)



Profile of Borings Legend

Symbol	Description
Strata symbols	
	Lean Clay Topsoil
	Lean Clay
	Fat Clay
	Lean to Fat Clay
	Lean to Fat Clay Topsoil
Misc. Symbols	
▽	Water table at completion

ALLENDER BUTZKE ENGINEERS, INC.

SE Polk Transportation Building & Imps.

8445 NE University Avenue

Pleasant Hill, Iowa

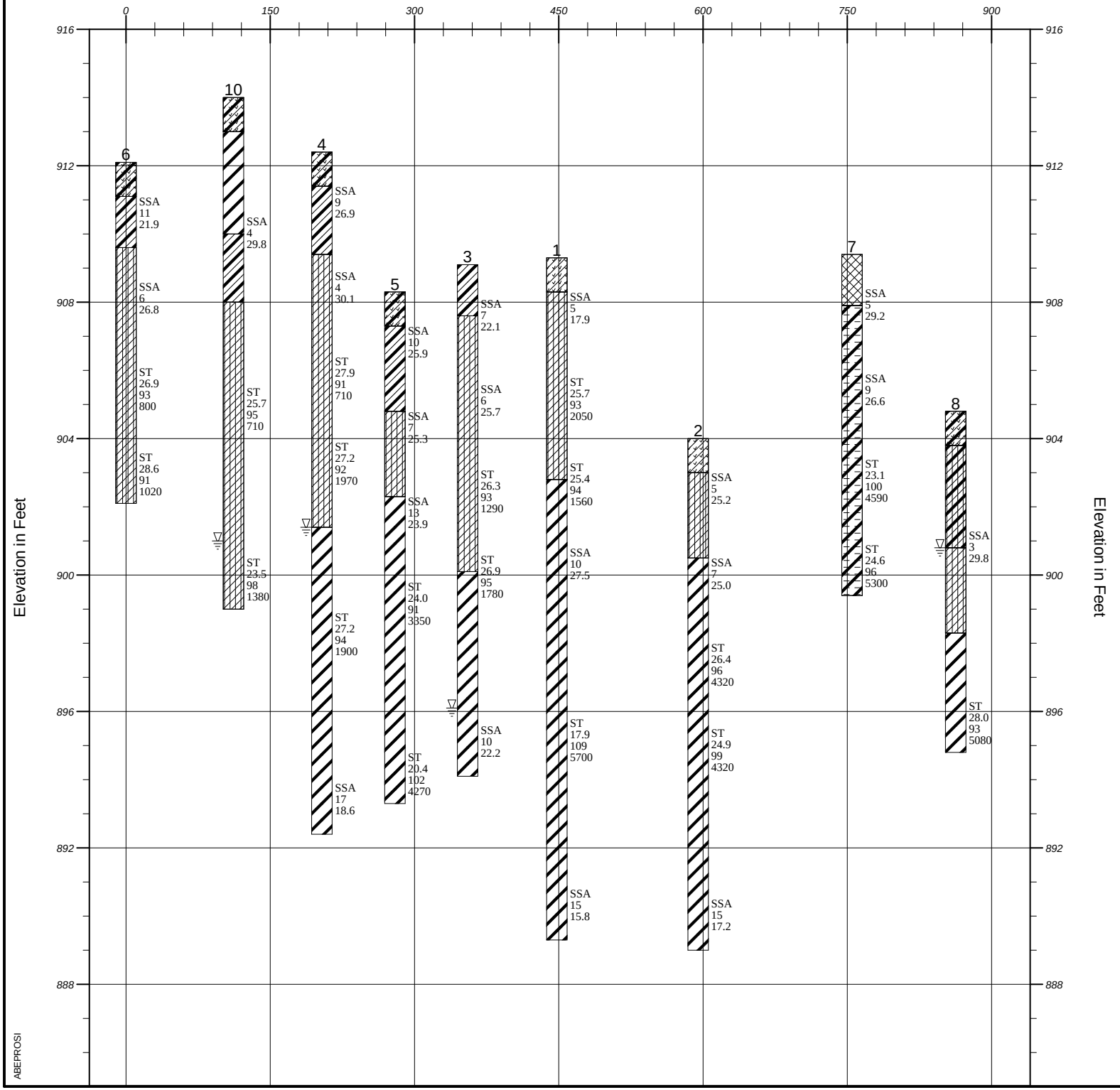
PN 251201

Vertical Scale: 1 inch = 4 feet

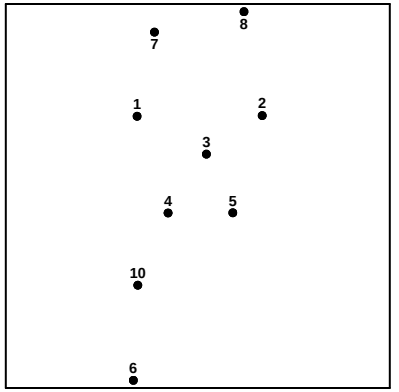
Plate A-1

ABEPROSI

PROFILE OF BORINGS



Plan View (NORTH)



Profile of Borings Legend

Symbol	Description
Strata symbols	
	Lean to Fat Clay Topsoil
	Lean to Fat Clay
	Lean Clay
	Fat Clay
	Lean Clay Topsoil
	Lean Clay Fill
	Fat Clay Alluvium
	Lean to Fat Clay Loess
Misc. Symbols	
▽	Water table at completion

ALLENDER BUTZKE ENGINEERS, INC.

SE Polk Transportation Building & Imps.

8445 NE University Avenue

Pleasant Hill, Iowa

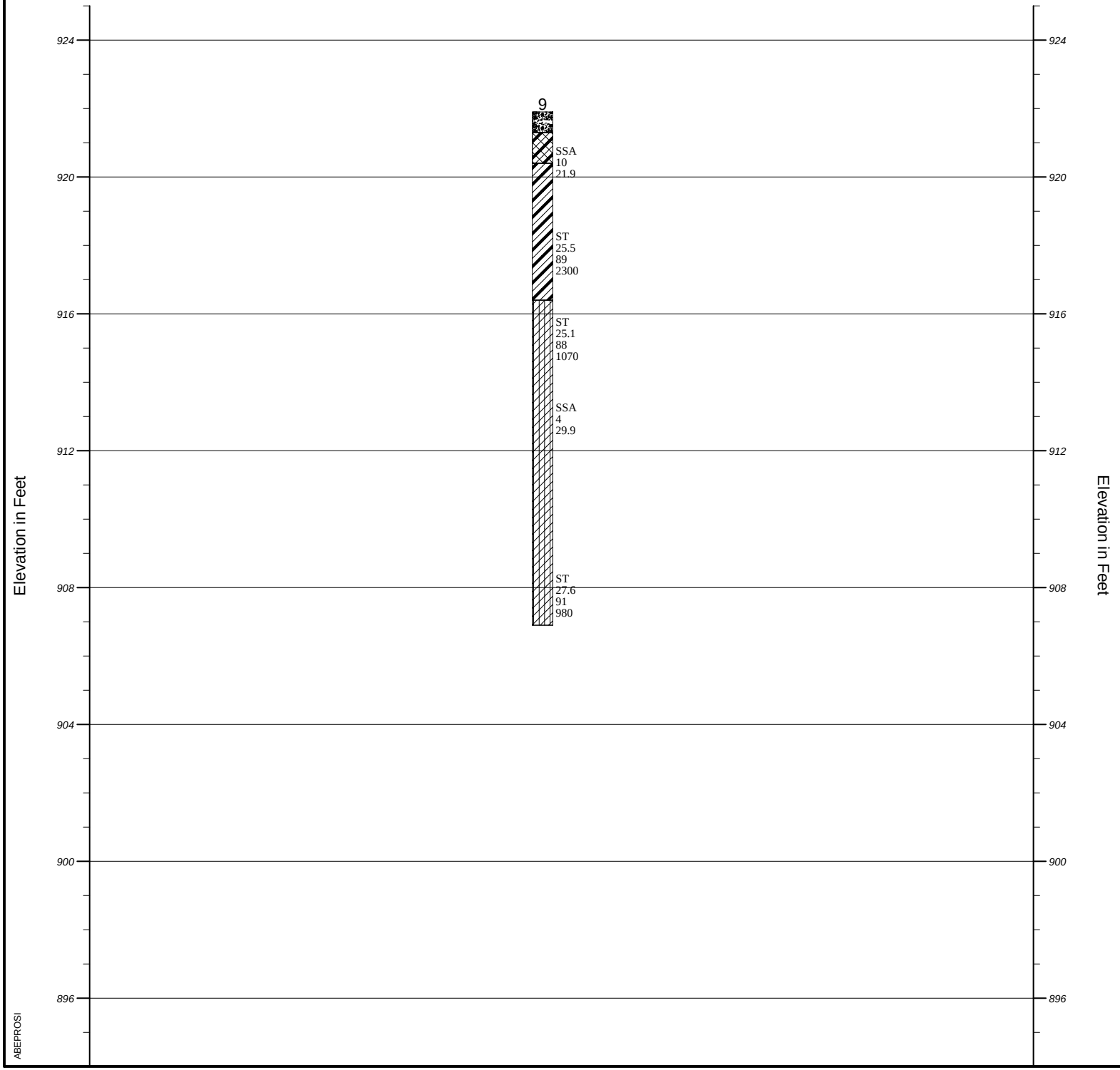
PN 251201

Vertical Scale: 1 inch = 4 feet

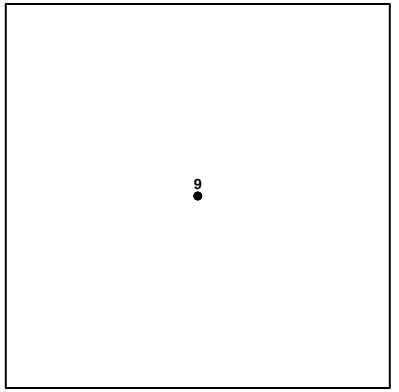
Plate A-2

ABEPROSI

PROFILE OF BORINGS



Plan View (NORTH)



Profile of Borings Legend

Symbol	Description
Strata symbols	
	PC Concrete
	Lean to Fat Clay Fill
	Lean to Fat Clay
	Lean Clay

ALLENDER BUTZKE ENGINEERS, INC.

SE Polk Transportation Building & Imps.

8445 NE University Avenue

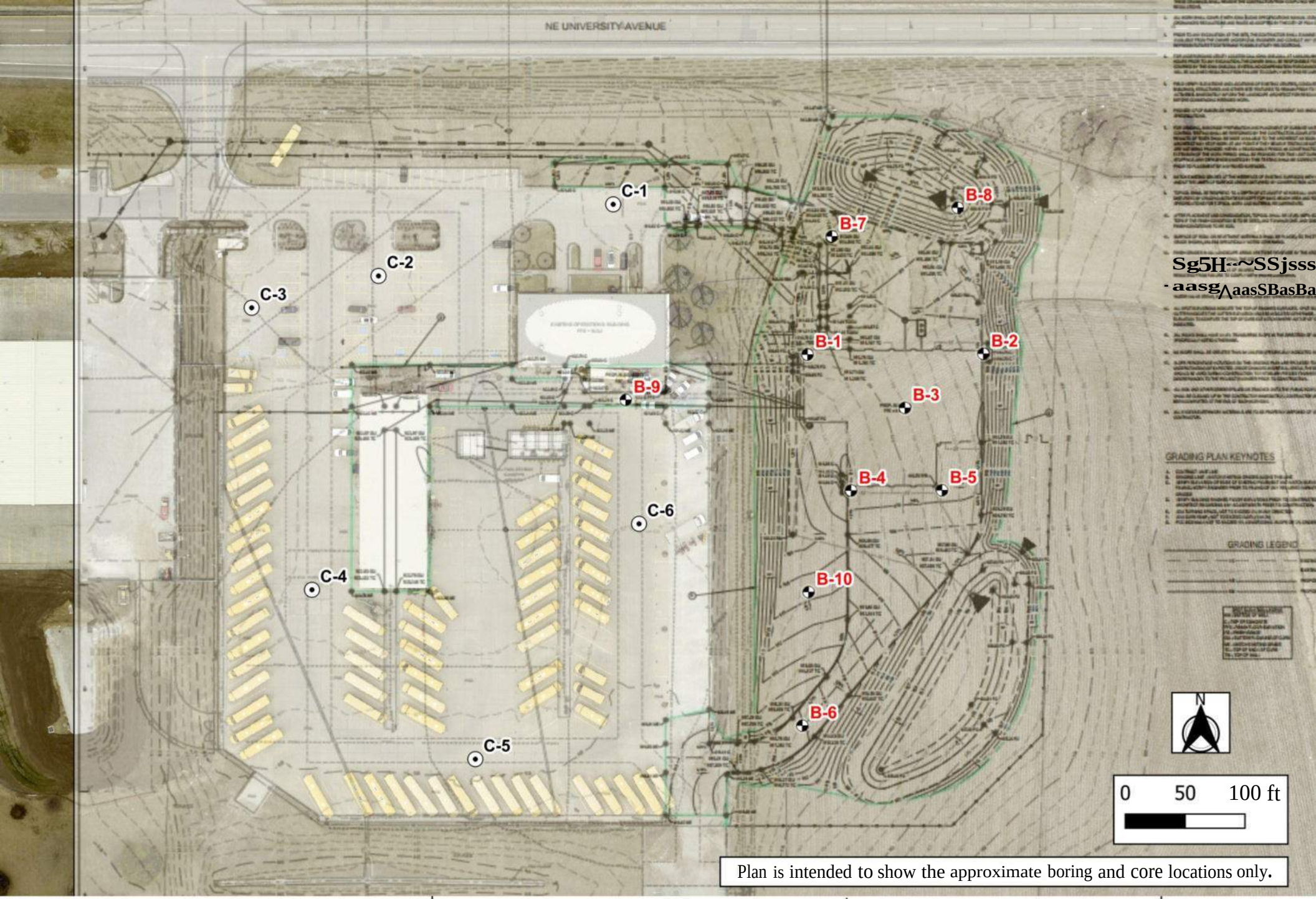
Pleasant Hill, Iowa

PN 251201

Vertical Scale: 1 inch = 4 feet

Plate A-3

ABEPROSI



Plan is intended to show the approximate boring and core locations only.

ALLENDER BUTZKE ENGINEERS INC. 3660 109th Street Urbandale, IA 50322	Southeast Polk Transportation Building 8415 NE University Avenue Pleasant Hill, Iowa	Approximate Overlay by RDG 2024 Polk County Aerial	PN 251201 Site Plan

NOTES